HOARDS FROM THE EUROPEAN BRONZE AND IRON AGES

NEW APPROACHES IN ARCHAEOLOGY

VOLUME 4

General Editor
Paul S. Johnson, *University of Nottingham*

Editorial Board
Marianne Hem Eriksen, *University of Leicester*
Lara Fabian, *University of California, Los Angeles*
Linda Gosner, *Texas Tech University*
Christopher Loveluck, *University of Nottingham*
Cheryl A. Makarewicz, *University of Kiel*
Dimitrij Mlekuž, *University of Ljubljana*

Hoards from the European Bronze and Iron Ages

Current Research and New Perspectives

Edited by

MARCIN MACIEJEWSKI, JÁNOS GÁBOR TARBAY, AND KAMIL NOWAK

BREPOLS

© 2024, Brepols Publishers n.v., Turnhout, Belgium.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise without the prior permission of the publisher.

D/2024/0095/275
ISBN 978-2-503-60751-1
e-ISBN 978-2-503-60752-8
DOI 10.1484/M.NAA-EB.5.134888
ISSN 2983-9645
e-ISSN 2983-9653

Printed in the EU on acid-free paper.

Previously published books are listed at the end of the book

Table of Contents

1. Hoards Research — Past, Present, Future 13
A Few Words of Introduction
Marcin Maciejewski, János Gábor Tarbay, and Kamil Nowak

2. In an Interpretive Triangle 21
Main Trends in Research on Hoards in the Nineteenth and Twentieth Centuries: A Central European Perspective
Wojciech Blajer

3. The Cognitive Development of Prehistoric Wetland Deposition Tradition Through Mnemonics 31
Case Studies of Iron Age Wales and Scotland
Tiffany Treadway

4. *There Is a Light that Never Goes out!* 41
New and Old Hoards from the Northern Adriatic
Martina Blečić Kavur

5. The Urnfield-Period Metal Hoards in South Bohemia 53
Find Circumstances, Topography, and Analyses
Ondřej Chvojka, Jan John, Jiří Kmošek, and Tereza Šálková

6. An Active Search for Hoards? Contributions of a Systematic Field Survey to the Knowledge of Bronze Age Metal Hoarding 69
The Case Study of Salins-les-Bains, Jura, France
Estelle Gauthier and Jean-François Piningre

7. Ice-Marginal Valleys and Hoards 91
Natural Landscapes, Cultural Practices, and their Amazing Convergence in Different Regions of Central Europe (Poland)
Marcin Maciejewski

8. Twin Hoards and Hoard Selections from Late Bronze Age Transdanubia 107
János Gábor Tarbay

9. Late Bronze Age Hoard from Nowe Kramsko 131
Is There a Method in Fragments?
Kamil Nowak and Nicola Ialongo

10. Comparative Technological Analysis of Middle Bronze Age Bronze Objects from Hoards and Burials 149
Szilvia Gyöngyösi, Laura Juhász, Péter Barkóczy, Julianna Cseh, and Géza Szabó

11. Re-theorizing Deposition in Bronze Age Europe 171
Kristian Kristiansen

List of Illustrations

3. The Cognitive Development of Prehistoric Wetland Deposition Tradition Through Mnemonics — *Tiffany Treadway*

Figure 3.1. Handles from the Nant-y-cafn hoard reported from Wales in 1875. 34
Figure 3.2. One of the many tyres from the Llyn Cerrig Bach hoard reported from Wales in 1942–1945. 34
Figure 3.3. Preferred wetland depositional landscapes observed from case studies sourced from British Iron Age Wales and Scotland. 35
Figure 3.4. Associated sediment types observed from preferred wetland locations for deposition. 36
Figure 3.5. Associated object types by quantity in comparison with the different wetland landscapes in which they were reported. 37

4. *There Is a Light that Never Goes out! — Martina Blečić Kavur*

Figure 4.1. Geographical position of Istria and Kvarner with sites discussed in the text. 42
Figure 4.2. 1–3: Late Bronze Age hoard from Monte Maestá; 4: winged axe from Tribalj; 5: socket axe from Osor. 43
Figure 4.3. Late Bronze Age hoard from Moravička Sela. 44
Figure 4.4. Distribution of double picks of Carpathian types (●) and miniature double picks (▲). 44
Figure 4.5. 1–3: Late Bronze Age hoard from Baredine; 4: axe from Buje; 5: mould from Sermin. 45
Figure 4.6. Late Bronze Age hoard from Prem. 45
Figure 4.7. Spatial distribution of hooks in the third and second millennia BC. 46
Figure 4.8. Distribution map of the winged axes of Ansciano, Ponte S. Giovanni, and Teor types and mould from Sermin. 47
Figure 4.9. Early Iron Age hoard from Malinica. 48
Figure 4.10. Distribution of the Iron Age hoards of the Bologna, San Francesco-Šempeter type. 49

5. The Urnfield-Period Metal Hoards in South *Bohemia — Ondřej Chvojka, Jan John, Jiří Kmošek and Tereza Šálková*

Figure 5.1. Current state of knowledge of Bronze Age hoards in southern Bohemia. 54
Figure 5.2. Chronological distribution of Urnfield-Period hoards in southern Bohemia. 54
Figure 5.3. Všeteč. An example of a hoard (Br C2/D) documented in situ in the field (A) and subsequently after laboratory preparation (B). 55
Figure 5.4. Staré Sedlo. Hoard of mostly complete products from the Br D–Ha A1 stages. 56
Figure 5.5. Examples of prestigious artefacts from the Urnfield-Period hoards from southern Bohemia. 1–3: Olešná 2 ; 4: Držov; 5: Paseky. 57
Figure 5.6. Paseky. A hoard of six identical sickles. 57
Figure 5.7. Chřešťovice. Spatial connection between the Final Bronze Age hillfort (no. 1) and a hoard of the same time (no. 2). 58
Figure 5.8. Metal hoards (black triangles) of the stages Br C2/D in southern Bohemia. 59
Figure 5.9. Metal hoards (black triangles) of the stages Br D–Ha A2/B1 in southern Bohemia. 59
Figure 5.10. Metal hoards (black triangles) of the stages Ha B1–3 in southern Bohemia. 60
Figure 5.11. Rataje. A: location of two hoards in the area of the Late Bronze Age settlement (hatched); B: profile of the settlement layer (1002) with hoard no. 1; C: hoard no. 2 in a ceramic container. 60
Figure 5.12. Krtely. Hoard of bronze products, their fragments, and copper ingots from a burial mound. 61
Figure 5.13. Classification of south Bohemian Urnfield-Period hoards after their topography. 62

Figure 5.14. Paseky. Topography of six hoards (Br D–Ha A) in the Písecké Mountains. 62
Figure 5.15. Box plot of lead content in final products and copper 'cake' ingots from the Krtely hoard (unpublished data). Values are given in percentages. 63
Figure 5.16. Staré Hodějovice. Comparison of the lead isotope ratios $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$ and $^{207}Pb/^{206}Pb$, $^{208}Pb/^{206}Pb$, of the analysed samples with copper ore and slag from the Erzgebirge, Bohemian Massif, Mitterberg region, Valais region, and south-eastern Alps region. 65
Table 5.1. Results of portable XRF analyses of sickles from the Paseky hoard and cups from Olešná 2. 64

6. An Active Search for Hoards? Contributions of a Systematic Field Survey to the Knowledge of Bronze Age Metal Hoarding — *Estelle Gauthier and Jean-François Piningre*

Figure 6.1. General map of the discoveries in the vicinity of Salins-les-Bains. 72
Figure 6.2. Composition of the hoards of the sector of Salins-les-Bains: a) total number of items per hoard; b) total mass hoarded. 73
Figure 6.3. Dating of the hoards of Salins-les-Bains. 73
Figure 6.4. The hoard of Saizenay is representative of the hoards from the Middle/Late Bronze Age transition, composed of ingots and axe-head fragments. 74
Figure 6.5. Hoard 12 from Pretin, dating from Bz D2/Ha A1, consists of 164 fragments belonging to a wide variety of functional categories. 74
Figure 6.6. Plan of hoard 18 from Pretin: the fragments are scattered over a surface of approximately 75 m^2. 75
Figure 6.7. The hoard of Lombard was discovered inside a crack of a large rock. 75
Figure 6.8. The bronze objects of Chaumois d'Amont hoard 1 were grouped under a clay layer and a dense cover of flat stone slabs. 76
Figure 6.9. Topographic profile of the hoard of Chay: the main cluster of objects (probably corresponding to the original position of the hoard) is located in the middle of the slope, at some distance from the large blocks at the edge of the sinkhole. 77
Figure 6.10. Hoard 15 from Pretin was buried at the foot of large stone blocks, standing out clearly in the landscape. 78
Figure 6.11. The visual relationships between the hoarding places correspond to an 'intervisibility web' covering the central sector around the Camp du Château and Mont Poupet. 79
Figure 6.12. Visible areas from the Camp du Château and Mont Poupet: almost all the hoards of the central sector are visible from both of these two points. 81
Figure 6.13. Hoard 1 from Malans is representative of the very small hoards that constitute the majority of discoveries in the region of Salins. 83
Figure 6.14. The length of the hoarded fragments seems to be standardized. a) Compared to the estimated length of the complete objects, the measured length of the hoarded pieces is concentrated at around 3–5 cm. b) The comparison of the length of the objects from the hoard of Chay to the estimated length of complete objects ('fragmentable' objects only: excluding foundry waste and very small objects) suggests a deliberate equalization of their length. 83
Figure 6.15. The pins of hoard 1 of Bois Bovard were found between two prominent blocks, both folded in half in the same way, then stuck vertically into the ground, in parallel, with the fold upwards. 84
Figure 6.16. Hypothetical model of the territory controlled by the hillfort of the Camp du Château during the Middle Bronze Age and the beginning of the Late Bronze Age. 86

7. Ice-Marginal Valleys and Hoards — *Marcin Maciejewski*

Figure 7.1. Map showing the location of Rosko, Karmin, and the Toruń–Eberswalde and Baruth–Głogów ice-marginal valleys. 92
Figure 7.2. Location of the Late Bronze Age and Early Iron Age archaeological sites near Rosko, including hoards. 94
Figure 7.3. Terrain shape and the hydrological network of the Warta–Noteć interfluve dune fields compared to other geographical regions of the Toruń–Eberswalde ice-marginal valley and the surrounding Pomeranian and Wielkopolska Lakelands. 96
Figure 7.4. Location of the Karmin hoards along with the artefacts from Wrocław collections. 98
Figure 7.5. The potential crossing of the Barycz Valley, taking into account the Late Bronze Age and the Early Iron Age archaeological sites. 100

Figure 7.6. Potential visibility from where hoard II (A), hoard I (B), hoard IV (C), hoard III (D), and a bronze socketed axe (F) were discovered, as well as potential visibility from the site of the hypothetical settlement on the southern edge of the Barycz Valley — Postolin Sites 2 and 26 (E) and from the settlement at the bottom of the Barycz Valley — Kaszowo Site 3 (G). 101

8. Twin Hoards and Hoard Selections from Late Bronze Age Transdanubia — *János Gábor Tarbay*

Figure 8.1. The selection of the Budakeszi A and B hoards. 108
Figure 8.2. Selected images of the metalwork wear analysis of Budakeszi-Őzvölgy-tető, hoard A: A. sharpened knobbed sickle edge with notches, B. hammer marks related to partition, C. blade of an as-cast Palotabozsok type axe, D. worn breakage surface of a socketed axe. 110
Figure 8.3. Selected images of the metalwork wear analysis of the Budakeszi-Őzvölgy-tető, hoard B: A. worn-out patterns of a spearhead, B. multiple worn notches along the cutting edge of a spearhead, C. scratches and worn notches along the cutting edge of a pseudo-winged axe. 111
Figure 8.4. Metalwork wear analysis and context, Budakeszi-Őzvölgy-tető hoards A and B. 113
Figure 8.5. The selection of the Kesztölc-Bodzás-dűlő hoard. 114
Figure 8.6. Metalwork wear analysis and reconstructed context, Kesztölc-Bodzás-dűlő. 115
Figure 8.7. The selection of the Nagydém-Gerha-dűlő hoards. 117
Figure 8.8. The selection of the Hódmezővásárhely-Fehértó hoards. 118
Figure 8.9. Correspondence analysis of the typological content of Ha A2/Ha B1, Ha A–Ha B1, and Ha B1 hoards from Transdanubia. 120
Figure 8.10. Technological groups of Ha A2/Ha B1, Ha A–Ha B1, and Ha B1 hoards from Transdanubia. 121
Figure 8.11. Correspondence analysis of the fragmentation of Ha A2/Ha B1, Ha A–Ha B1, and Ha B1 hoards from Transdanubia. 122
Figure 8.12. Transdanubian selection groups based on fragmentation and technological types. 123

9. Late Bronze Age Hoard from Nowe Kramsko — *Kamil Nowak and Nicola Ialongo*

Figure 9.1. Location of the hoard on the map of Poland. 132
Figure 9.2. The inventory of the hoard from Nowe Kramsko. 133
Figure 9.3. The metalworker's tool kit from the hoard inventory. 134
Figure 9.4. Traces of manufacture and use wear on the socketed axes and sickles. 136
Figure 9.5. The manufacture and use-wear traces observed on the sickles and spearheads. 138
Figure 9.6. Ornaments: the preparation for use: grinding, decorating, separating of the casting jet. 139
Figure 9.7. Smashing and crushing objects causes jagged and uneven fracture edges. 140
Figure 9.8. Traces of intentional and planned separation fragments from the sickles. 141
Figure 9.9. Traces of intentional and planned separating of the bracelet fragments. The arrow marks the saw cut. 142
Figure 9.10. Cosine Quantogram Analysis (CQA). Analysis of bronze fragments and balance weights. A: Quantogram of the fragments of Nowe Kramsko is compared with the quantograms of balance weights and bronze fragments from in Central Europe. B: Quantogram of the total sample of fragments from Central Europe and Nowe Kramsko, compared with the quantograms of the fragments from Central Europe (without Nowe Kramsko) and balance weights. 145
Table 9.1. Use-wear, preparation, and manufacture traces on the complete objects. 143
Table 9.2. Use-wear, preparation, and manufacture traces on the fragmented objects. 143

10. Comparative Technological Analysis of Middle Bronze Age Bronze Objects from Hoards and Burials — *Szilvia Gyöngyösi, Laura Juhász, Péter Barkóczy, Julianna Cseh and Géza Szabó*

Figure 10.1. The location of the hoards and cemetery (a) and objects from the different hoards: cemetery of Vértesszőlős (b) and Zalaszabar hoard (c). 151
Figure 10.2. Micrographs of bronze needle V2 from the Vértesszőlős hoard. Sample prepared by K_2CrO_4 and photos taken in polarized illumination. 153
Figure 10.3. Micrographs of pendant V29 from the Vértesszőlős hoard. Sample prepared by etching in K_2CrO_4 and photos taken in polarized illumination (a, b) which show the grain structure. Sample etched by $FeCl_3$ and photos taken in bright field illumination (c, d). In these pictures the inclusions can be seen. 153

Figure 10.4. Micrographs of hemispherical stud V40 from the Vértesszőlős hoard. Sample prepared by etching in K_2CrO_4 and photos taken in polarized illumination (a). Recrystallized grain structure can be seen on the photo with medium-sized grains. Small elongated CuS inclusions can be found in the sample after $FeCl_3$ etching in bright field illumination (b). SEM photo and element map show the CuS inclusions in larger magnification (c, d). 154
Figure 10.5. Micrographs taken from the Ω-shaped pendant V64. The colour etching reveals the grain structure (a, b). A duplex grain structure can be seen, with a far smaller grain size on one side of the pendant (b). Globular small-sized copper sulphide and lead inclusions can be observed in a bright field image (c). 155
Figure 10.6. The wire arm ring V75 has a recrystallized structure (a). In a bright field micrograph larger and smaller inclusions can be seen (b). The majority of the inclusions are copper sulphide, but a few lead inclusions also exist. 156
Figure 10.7. The colour etching reveals a recrystallized grain structure of the wire spiral beads. larger and smaller inclusions can be seen in the bright field micrograph (b). The large inclusions are copper sulphide ones, the smaller ones are lead inclusions. The sulphide inclusions have an elongated shape (d). Next to the lead inclusions tin and antimony inclusions appear near the corrosion layer (c). 157
Figure 10.8. The microstructure of the omega-shaped pedant (2010.2.21). The grain structure is recrystallized (a). There are inclusions with a slightly elongated shape in the microstructure (b). 158
Figure 10.9. The omega-shaped pedant (2010.2.27) has a recrystallized grain structure (a). The microstructure built up by medium-sized grains. There are a lot of globular sulphide inclusions in the microstructure (b). 159
Figure 10.10. Dendritic microstructures show the as-cast state of the omega-shaped pedant (2010.2.39). In higher magnification intermetallic phases can be seen, which form due to the microsegregation process during crystallization (b). 159
Figure 10.11. Intensive general corrosion process reduced the metallic cross-section of the inverted heart pendant (2010.2.48). Recrystallized grain structure revealed by the colour etching (a). Medium-sized elongated copper sulphide inclusions exist in the microstructure too (b). 160
Figure 10.12. The crescent-shaped pendant (2010.2.59) has a crystallized microstructure. Large dendritic grains built up the microstructure (a). The small secondary dendrite arm spacing (b) suggests a high cooling rate. 160
Figure 10.13. The wires needed to be annealed before winding to make the spectacle spiral pendant (2010.2.61). Accordingly, the optical micrograph shows a recrystallized grain structure (a). Small copper sulphide and lead inclusions can be seen in the microstructure (b). 161
Figure 10.14. The colour etching of spiral plate bead (2010.2.71) revealed a recrystallized grain structure. In the bright field image (b) the microsegregation outlines the dendritic structure of the cast precursor. Additionally, small inclusions can also be seen in the microstructure. 161
Figure 10.15. The bronze pin (2010.2.78) has a recrystallized grain structure which can clearly be seen in the colour etched structure (a) and in the bright field (b) image. Small, elongated inclusions can also be seen in the bright field image. 162
Figure 10.16. Optical microscopic images of spiral wire bead BQ200 (J4) (a). SEM-EDS element map shows the silver segregation in the corrosion layer. 163
Figure 10.17. Micrographs taken from spiral wire beads BQ84 (J5) (a), BQ84 (J6) (b), BQ31 (J3) (c), and BQ151 (J12) (d). 163
Figure 10.18. Optical microscopic images taken from object BQ114 (J4) (a) and BQ114 (J17) (b). The pendants are affected by strong corrosion. Just a few grains can be seen in the metallic part of the section. 164
Figure 10.19. Photos and bright field optical microscopic images of wire arm ring BQ231 (J1) (a), BQ231 (J2) (b) and BQ231 (J3) (c). Strong corrosion effects can be observed in the micrographs. 165
Figure 10.20. Optical micrographs of BQ231 (J3) wire arm ring. Image was taken in polarized illumination after etching by K_2CrO_4 (a) and in bright field illumination after $FeCl_3$ etching. 166
Figure 10.21. Optical micrographs of arm ring BQ209 in polarized light, 50× magnification (a). SEM micrograph, 5000× magnification (b). 166

Table 10.1. The average chemical composition of the objects from the Vértesszőlős cemetery. The composition measured by SEM-EDS technique and presented in w / w% units. 158
Table 10.2. Average chemical composition of the objects examined from the Zalaszabar hoard. The concentration values in the table are in w / w% unit. 162
Table 10.3. The average composition of the examined objects from the Bonyhád cemetery. The concentration is in w / w% units. 167

11. Re-theorizing Deposition in Bronze Age *Europe — Kristian Kristiansen*
Figure 11.1. Model for depositional variability. The papers of this book reflect most of the variation in Fig. 11.1. 173

MARCIN MACIEJEWSKI, JÁNOS GÁBOR TARBAY, AND
KAMIL NOWAK

1. Hoards Research — Past, Present, Future

A Few Words of Introduction

Throughout almost all historical periods, various types of goods were deposited on the European continent and beyond (Bradley 2017). Among the most spectacular ones, as well as the most frequently discussed examples of this phenomenon are metal hoards dated to the Bronze Age and in some regions also until the Iron Age (second half of the third millennium BC to first millennium AD). They are also known for being one of the most enigmatic categories of archaeological find, the interpretation of which is still puzzling to many scholars. Hoards have been interpreted for decades based on a rather limited database of relevant information. This formalized field of data has entailed typological research results, which mainly dealt with relative chronology and distribution of artefact categories in an extraregional context. For decades, this has been the dominant research trend, manifested in seminal hoard catalogues by country, for example the well-known *Prähistorische Bronzefunde* volumes (Jockenhövel 2016; Falkenstein 2016), as well as synthesizing monographs (such as Hansen 1991; 1994; Bratu 2009), and individual books focusing on the evaluation of key hoard assemblages from all over Europe (e.g., Coffyn and others 1981; Salaš 1997; Clausing 2003; Weihs 2004; Hagl 2008; Soroceanu and others 2017). Other approaches established 'horizon models' based on the typological combination of hoarded objects (von Brunn 1968) within the limits of schemes left to us by Oscar Montelius, Paul Reinecke, and Hermann Müller-Karpe (Gerloff 2007). Despite a distinction being made between aquatic, terrestrial finds, and individually deposited objects, further data on hoards has rarely been taken into account (in more detail, see Blajer in this volume).

The situation was similar when it came to interpreting this phenomenon. Scholars have focused on the dichotomy between ritual and non-ritual motives for metal object deposition, thus sorting these assemblages into different kinds of subcategories like merchant hoards, votive hoards, etc. (Eggert 2001, 80–82). Such explanations were proposed as early as in the nineteenth and early twentieth centuries (e.g., Chantre 1875–1876, 68; Evans 1881, 457; Sadowski 1876; Hampel 1896; Schumacher 1903) and they are still affecting our current discussion on the evaluation of hoards. Currently, ritual interpretations seem to dominate mainstream research mainly owing to the Berlin School of Bernhard Hänsel and Svend Hansen (Hänsel and Hänsel eds 1997; Hansen 1991; 1994), but also so-called reasonable arguments have been proposed for the mundane approaches up until recent times (Wiseman 2018). It was David Fontijn who showed that the same data could be used to argue for opposite conclusions (Fontijn 2002, 13–21, table 2.1–2.3). This discourse can be called 'scientific trench warfare'. Just as wars do not solve problems, the division into supporters of a ritual or non-ritual interpretation of hoards has not encouraged the search for alternative models. In turn, Bradley (1998, 15) pointed out that which 'side of the front' researchers are on to some degree depends on which part of Europe they come from and the recent history of this area. Distinguishing ritual and mundane activities in Bronze Age and Iron Age societies also requires reflection. It is very commonly used in hoard research (perhaps the most detailed analysis was done by Levy 1982). Various authors, relying on various premises, indicate that such a division is a transfer of

Marcin Maciejewski • Institute of Archaeology, Maria Curie-Skłodowska University (marcin.maciejewski@umcs.pl)
János Gábor Tarbay • Department of Archaeology, Scientific Directorate, National Institute of Archaeology, Hungarian National Museum, Hungarian National Museum Public Collection Centre (tarbay.gabor@hnm.hu)
Kamil Nowak • Department of Prehistory, Institute of Archaeology Nicolaus Copernicus University in Toruń (kamil.nowak@umk.pl)

Hoards from the European Bronze and Iron Ages: Current Research and New Perspectives, ed. by Marcin Maciejewski, János Gábor Tarbay, and Kamil Nowak, NAA, 4 (Turnhout, 2024), pp. 13–19.
BREPOLS PUBLISHERS
DOI 10.1484/M.NAA-EB.5.142433

our contemporary cultural patterns into the lives of prehistoric communities (see Pałubicka 1985, in the case of hoards, also Maciejewski 2016, 72–78; Bradley 2005, there are numerous references to anthropological research). Essential, too, is the analysis of material from the Greek and Italian sanctuaries, which indicates the fact that boundaries between the votive and mundane aspects of deposited objects could be crossed (Baitinger 2013; 2018).

The past few years have brought a series of new research propositions for the means of patterning, investigating, and interpreting this phenomenon. They are based both on new theoretical proposals as well as on an increasingly broad range of data describing the context of the deposition act and individual artefacts, often observed even at the level of individual atoms. The new directions include the analyses of the hoards' context (e.g., Soroceanu 1995; V. Szabó 2019), theorizing and characterizing fragmentation and manipulation of deposited finds (e.g., Nebelsick 2000; Rezi 2011; Hansen 2016; Knight 2019; Valera ed. 2019; Knight 2020), the interpretation of the depositional landscape (e.g., Fontijn 2002; Hansen 2008; Hansen and others eds 2012; Ballmer 2015; Hansen and others eds 2016; Vachta 2016; Maciejewski 2016; Bradley 2017) or the integration of rapidly growing and diverse data provided by the archaeometallurgical research and microscopic use-wear analyses of objects (e.g., Ilon 2015; Piningre and others 2015; Bottaini and others 2016; Dolfini and Crellin 2016; Baron and others 2019; Baron and others 2020; Mödlinger and Trebsche 2020; Tarbay and others 2021). Both the development of archaeology and the significant growth in the number of newly discovered metal artefacts lead one to consider the appropriate means of researching these enigmatic finds.

The metal hoards from the Bronze Age are known practically all over Europe (e.g., Hänsel and Hänsel 1997; Fontijn 2019, fig. 8.1; Hansen 1994). In the Iron Age, the custom of depositing metal objects varies but still had a supraregional character (see Bradley 2017, further literature there). Of course, this practice was changing, disappearing and reappearing (e.g., Bradley 1998, 95–114; Kristiansen 1998, 74, fig. 32A; Blajer 2001, 202–04), as has been described by hundreds if not thousands of scientific papers and books that have been devoted to this topic.

One of the ways to understand this phenomenon is to look at it from the perspective of an entire continent. The second is to extend the scope of analyses and apply them to specific archaeological finds. There are more and more puzzles, but to put them together, one needs to look at them from the right perspective. How to do it? How to bring together researchers from different regions of Europe to start a dialogue and formulate a discussion? Achieving all this could be confirmed by going beyond the typo-chronology of hoarded artefacts. The above-mentioned increase in the range of methods used in hoard research — related to the dynamic development of so-called archaeological sciences — is a unique opportunity to conduct Pan-European discussions. We had such an idea when we organized a session (# 45 — Current Research on Bronze and Iron Ages Hoards) during the 26th EAA Virtual Annual Meeting, where some of the papers published in this book were presented. This is the idea that guides us now as we present this book to you. We hope that such an idea will accompany us in the future when a Pan-European hoards research network may be established.

Eleven papers are presented in this book. Most of them are focused on the Bronze Age, and some are involved in the discussion of Iron Age hoards. The authors present new research results from various regions of Europe (the British Isles, the north-western Balkans, the Carpathian Basin, and areas of the contemporary Czech Republic, France, and Poland). The texts discuss a wide spectrum of problems, and it can be said that most of the currently important issues are reflected in this volume.

If we want to present a new approach, it is also worth looking back. To know what is new, you need to know what is a 'classic'. This is the purpose of the paper by Wojciech Blajer that opens this volume. The author presents how approaches to hoard research have changed, mainly in Polish archaeology, but also in the context of inspiration from various other countries. The author points to three main influences — German-language archaeology (not only researchers from Germany), researchers from Scandinavia, and from Hungary. Interestingly, it was similar in the Bronze Age when significant cultural patterns were passed on from the Carpathian Basin, the Alpine area, and the Nordic Bronze Age.

Tiffany Treadway, the author of the next paper, deals with the theoretical reinterpretation of Iron Age wetland deposition in Wales and Scotland. She refers to the theory of educational, psychological, and sociological studies and shows that hoards (acts of depositing metal objects) could have many functions in prehistoric communities. In this case, she focuses on the processes of learning and getting to know cultural patterns as well as social and communal identity.

Martina Blečić Kavur's paper reveals new data on an 'uncharted' hoard landscape in the Late Bronze Age and Early Iron Age eastern *Caput Adriae*. Until recently, the deposition tradition on this supraregionally well-connected territory seemed absent. By introducing hoards and individual finds, the author has drastically changed this concept. The author also demonstrates that a more traditional, typological approach is still important and could bring new results in hoard research.

The following two articles, one by Ondřej Chvojka, Jan John, Tereza Šálková, and Jiří Kmošek, describing finds from south Bohemia, while Estelle Gauthier, Jean-François Piningre, Hervé Grut, Patrick Mosca, Patrick Guillot, and René Parisot present a case study from Salins-les-Bains, are fine works that demonstrate a multifaceted approach to hoard research. It is also worth noting that the finds discussed in them were discovered with the use of metal detectors. In the first case, the new finds are the result of collaboration between amateurs and archaeologists, and in the second, the result of planned searching. The use of these devices has significantly increased the number of known hoards, and these two examples show their potential for providing new scientific information. Of course, the issues related to the potential threat to the archaeological heritage are not black and white, but exploring this topic more fully would require at least a separate volume.

The articles described above consider, to a great extent, the importance of hoards in the landscape. This topic has been one of the most dynamically developing research directions in the archaeology of hoards in recent years. The paper by Marcin Maciejewski also provides an example of using the potential of this type of research. The author tries to take a new look at a very old concept linking hoards and routes.

Use-wear analysis of objects made from copper alloys has also been used very frequently recently and has great research potential. When describing the Transdanubian Late Bronze Age hoards, János Gábor Tarbay mentions them in his text. A very suggestive presentation of the selection in the Budakeszi-Őzvölgy-tető hoards and conclusions arising from the correspondence analyses of other Transdanubian finds allows the author to indicate a deposition scheme that would not be available without considering the traces on the artefacts. Kamil Nowak and Nicola Ialongo present a find from the Lubusz Land in western Poland. In the case of the Nowe Kramsko hoard, a very important issue is the fragmentation and use-wear traces on deposited items in the context of the Pan-European weight system. In both cases, there are references to issues related to the production of metal objects.

If we are talking about the production of copper-alloy items, then, of course, archaeometallurgical analyses cannot be ignored. In recent years, numerous analyses have been made, which is related to the increasing availability of appropriate research apparatus. An example of the use of such analyses is the last article by Szilvia Gyöngyösi, Péter Barkóczy, Julianna Cseh, Laura Juhász, and Géza Szabó. The authors compare the objects selected to Hungarian Middle Bronze Age hoards and burials with the aid of SEM-EDS chemical composition analysis and metallography. The approach presented here is an example of an in-depth natural scientific analysis of a hoarded object's technological character.

According to the title of the series, this volume presents new approaches. Some of the methods used in the featured articles have only recently become part of the toolbox of hoard research. Others are new approaches to old problems, sometimes using well-known methods. However, the intriguing question is what future approaches to hoard research will be. Of course, some directions can be indicated in line with the development of technology. One of them is the increasingly common use of 3D models. Importantly, this is not only a tool for creating and sharing digital copies of artefacts, but it also enables previously unavailable analyses (e.g., Baron and others 2019, 73–85). The application of 3D models is one of the many examples of the application of natural scientific techniques in hoard analysis becoming more and more important, with the use of X-ray, CT, and Neutron tomography contributing to the in situ excavation of hoards and to the formulation of opinions on the technological classification of hoarded objects (Popescu and others 2020; Tarbay and others 2021). There is also an increasing trend to use archaeometric data, especially elemental composition and isotope results which reveal new layers of information on the hoards or build up large-scale conclusions on the economy of the Bronze Age based on hoarded materials (Mödlinger and Trebsche 2020; Nowak and others 2023; Tarbay and others 2023).

The need to understand hoarding as a supraregional phenomenon based on a large quantity of data through statistical methods is an old dream, manifested in works that aimed to synthesize and compare different hoarding regions. Sooner or later, various artificial intelligence tools will also be used and start a new era in hoard statistics. It will then be possible to use very advanced statistical models and analyse large databases (Big Data, which are becoming smaller with the development of technology). An example of the use of such a large, albeit single-factor database, is presented in this volume in the text by Kamil Nowak and Nicola Ialongo. A shared, multi-factor, and digital database of hoards from across Europe would be invaluable in such research. Its creation is a demanding challenge requiring cooperation between researchers from different countries, but we are confident that it is possible.

The large number of newly discovered hoards is also a challenge but at the same time an opportunity. An opportunity that was not given to research in the past when these assemblages were generally delivered to the museum by private collectors, and local farmers, thus the information on the context was limited, and refined methods for the excavation technique and documentation of such complex assemblages had no

chance to evolve. This poses a new methodological challenge to archaeology today. Not only from the point of view of new information related to metal artefacts but also non-metal elements of hoards, such as various kinds of substances that were consumed from deposited metal and ceramic pots during their use-life or at the time of their deposition, especially using methods such as gas chromatography (Baron and others 2019, 97–100; Jílek and others 2021; Grześkowiak and others 2021; Blajer and others 2022, 153–58). The various types of wooden, stone, plant, leather, and bone parts of the deposited assemblages offer not only an opportunity for absolute dating but also a better understanding of the function and biography of individual artefacts as well as entire hoards (e.g., Blajer and others 2022).

An important question is whether we should focus on hoards of metal objects or the phenomenon of intentional, selective deposition (see Bradley 2017). For example, ceramic vessel deposits are a common phenomenon during the Bronze Age in Central Europe. They are fewer in number than finds consisting of metal objects, but deposition patterns are often clear. We hope that this topic will also be developed in the future. Issues related to non-metal elements in hoards of metal objects and deposits from other raw materials were discussed in a session at the 29th EAA Annual Meeting in Belfast 2023.

The archaeology of skill is one of the theoretical approaches that has been gaining more and more popularity in recent years (e.g., Kuijpers 2018; Nørgaard 2018). It is difficult to say what intellectual trends will develop in the future. By giving an overview of the various (new) approaches, we hope this book will also contribute to the creation of future ones.

Works Cited

Baitinger, Holger. 2013. 'Sizilisch-unteritalische Funde in Griechischen Heiligtümern. Ein Beitrag zu den Votivsitten in Griechenland in spätgeometrischer und archaischer Zeit', *Jahrbuch des Römisch-Germanischen Zentralmuseums*, 60: 153–296

Ballmer, Ariane. 2015. *Topografie bronzezeitlicher Deponierungen: Fallstudie Alpenrheintal*, Universitätsforschungen zur prähistorischen Archäologie, 278 (Bonn: Habelt)

Baron, Justyna, Marcin Maciejewski, Radosław Jarysz, Radosław Kuźbik, Dagmara Łaciak, Jeannette J. Łucejko, Maksym Mackiewicz, Beata Miazga, Kamil Nowak, and Dawid Sych. 2019. *Phenomenon of Repetition: Deposits from Karmin = Karmin: Fenomen powtarzalności* (Wrocław: Uniwersytet Wrocławski)

Baron, Justyna, Jacek Puziewicz, Kamil Nowak, Dawid Sych, Beata Miazga, and Małgorzata Ziobro. 2018. 'Vom Wert der Objekte: Zum Transfer und zur Weihung von Metallobjekten im Mediterranean Raum in archaischer Zeit', in *Opfer- und Festplätze von der Bronze- zur Latènezeit: Symposium 27.02.-01.03.2014*, ed. by Ludwig Kreiner, Archäologieim Landkreis Dingolfing-Landau 5 (Rahden: Leidorf), pp. 10–35

——. 2020. 'Same but Different. Composition, Production and Use of Bronze Arrowheads from the Late Bronze Age Deposit from Wrocław-Widawa in SW Poland', *Journal of Archaeological Science: Reports*, 32: 1–18

Blajer, Wojciech. 2001. *Skarby przedmiotów metalowych z epoki brązu i wczesnej epoki żelaza na ziemiach polskich* (Kraków: Księgarnia Akademicka)

Blajer, Wojciech, Tomasz Bochnak, Katarzyna Cywa, Aldona Garbacz-Klempka, Gabriela Glinianowicz, Piotr Jurecki, Piotr Kotowicz, Piotr Kuropka, Jeannette J. Łucejko, Marcin Maciejewski, Aldona Mueller-Bieniek, Kamil Nowak, Marcin M. Przybyła, and Katarzyna Skowron. 2022. *Ku czci bogów i ludzi: Skarby z okolic Sanoka; Studium interdyscyplinarne* (Lublin: Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej)

Bottaini, Carlo, Raquel Vilaça, Nick Schiavon, José Mirão, António Candeias, Rui Bordalo, Giovanni Paternoster, and Ignacio Montero-Ruiz. 2016. 'New Insights on Late Bronze Age Cu-metallurgy from Coles de Samuel Hoard (Central Portugal): A Combined Multi-analytical Approach', *Journal of Archaeological Science: Reports*, 7: 344–57

Bradley, Richard. 1998. *The Passage of Arms: An Archaeological Analysis of Prehistoric Hoard and Votive Deposits* (Oxford: Oxbow)

——. 2005. *Ritual and Domestic Life in Prehistoric Europe* (London: Routledge)

——. 2017. *A Geography of Offerings: Deposits of Valuables in the Landscapes of Ancient Europe*, Oxbow Insights in Archaeology, 3 (Oxford: Oxbow)

Bratu, Olimpia. 2009. *Depuneri de bronzuri între Dunărea mijlocie şi nistru în secolele XIII–VII a. Chr* (Bucharest: Editura Renaissance)

Brunn, Wilhelm Albert von. 1968. *Mitteldeutsche Hortfunde der jüngeren Bronzezeit*, Römisch-germanische Forschungen, 29 (Berlin: De Gruyter)

Chantre, Ernest. 1875–1876. *Études paléoethnologiques dans le bassin du Rhône*, II.2: *Âge du bronze: recherches sur l'origine de la métallurgie en France: gisements de l'âge du bronze* (Paris: Baudry)

Clausing, Christof. 2003. 'Ein urnenfelderzeitlicher Hortfund von Slavonski Brod, Kroatien', *Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz*, 50.1: 47–205

Coffyn, André, José Gomez, and Jean-Pierre Mohen. 1981. *L'apogée du bronze atlantique: le dépôt Vénat*, L'âge du bronze en France, 1 (Paris: Picard)

Dolfini, Andrea, and Rachel J. Crellin. 2016. 'Metalwork Wear Analysis: The Loss of Innocence', *Journal of Archaeological Science*, 66: 78–87

Eggert, K. H. Manfred. 2001. *Prähistorische Archäologie: Konzepte und Methoden*, UTB für Wissenschaft, 2092 (Tübingen: Francke)

Evans, John. 1881. *The Ancient Bronze Implements, Weapons, and Ornaments, of Great Britain and Ireland* (London: Longmans, Green)

Falkenstein, Frank. 2016. 'Zur Rezeption der "Prähistorischen Bronzefunde" und ihre Rückwirkung auf die Bronzezeitforschung Zentraleuropas', in *50 Jahre 'Prähistorische Bronzefunde' Bilanz und Perspektiven: Beiträge zum internationalen Kolloquium vom 24. bis 26. September 2014 in Mainz*, ed. by Ute Luise Dietz and Albrecht Jockenhövel, Prähistorische Bronzefunde, 20.14 (Stuttgart: Steiner)

Fontijn, David. 2019. *Economies of Destruction: How the Systematic Destruction of Valuables Created Value in Bronze Age Europe, c. 2300–500 BC* (London: Routledge)

——. 2002. 'Sacrificial Landscapes: Cultural Biographies of Persons, Objects and "Natural" Places in the Bronze Age of the Southern Netherlands, *c.* 2300–600 BC', *Analecta Praehistorica Leidensia*, 33–34: 1–392

Gerloff, Sabine. 2007. 'Reinecke's ABC and the Chronology of the British Bronze Age', in *Beyond Stonehenge: Essays on the Bronze Age in Honour of Colin Burgess*, ed. by Christopher Burgess, Peter Topping, and Frances Lynch (Oxford: Oxbow), pp. 117–61

Grześkowiak, Marek, Mariusz Fleszar, and Jerzy Wiśniewski. 2021. 'Preliminary Results of the Analysis of Lipid Residues from Bronze Vessels Found in the Hoard from Kaliska, Szczecinek District, Zachodniopomorskie Province', in *Kaliska*, I: *The Late Bronze Age Metal Hoard from Pomerania*, ed. by Maciej Kaczmarek, Grzegorz Szczurek, and Agnieszka Krzysiak (Poznań: Adam Mickiewicz University in Poznań), pp. 373–84

Hagl, Monika. 2008. *Ein urnenfelderzeitlicher Depotfund vom Bullenheimer Berg in Franken*, Bayerische Vorgeschichtsblätter, 19 (Munich: Beck)

Hampel, József. 1896. *A bronzkor emlékei Magyarhonban*, III: *Áttekintő ismertetés* (Budapest: Országos Régészeti és Embertani Társulat)

Hansen, Svend. 1991. *Studien zu den Metalldeponierungen während der Urnenfelderzeit im Rhein-Main-Gebiet*, Universitätsforschungen zur prähistorischen Archäologie, 5 (Bonn: Habelt)

——. 1994. *Studien zu den Metalldeponierungen während der älteren Urnenfelderzeit zwischen Rhônetal und Karpatenbecken*, Universitätsforschungen zur prähistorischen Archäologie, 21 (Bonn: Habelt)

——. 2008. 'Bronzezeitliche Horte als Indikatoren für "andere Orte"', *Das Altertum*, 53: 291–314

——. 2016. 'A Short History of Fragments in Hoards of the Bronze Age', in *Materielle Kultur und Identität im Spannungsfeld zwischen Mediterraner Welt und Mitteleuropa*, ed. by Holger Baitinger, RGZM Tagungen, 27 (Mainz: Verlag des Römisch-Germanischen Zentralmuseums), pp. 185–208

Hansen, Svend, Daniel Neumann, and Tilmann Vachta (eds). 2012. *Hort und Raum: Aktuelle Forschungen zu bronzezeitlichen Deponierungen in Mitteleuropa*, Topoi — Berlin Studies of the Ancient World, 10 (Berlin: Excellence Cluster Topoi)

——. (eds). 2016. *Raum, Gabe und Erinnerung: Weihgaben und Heiligtümer in prähistorischen und antiken Gesellschaften*, Topoi — Berlin Studies of the Ancient World, 38 (Berlin: Excellence Cluster Topoi)

Hänsel, Alix, and Bernhard Hänsel. 1997. *Gaben an die Götter: Schätze der Bronzezeit Europas*, Bestandkataloge, 4 (Berlin: Museum für Vor- und Frühgeschichte)

Ilon, Gábor. 2015. *The Golden Treasure from Szent Vid in Velem: The Costume of a High-Ranking Lady of the Late Bronze Age in the Light of New Studies*, Series minor, 36 (Budapest: Archaeolingua Fundation)

Jílek, Jan, Martin Golec, Petr Bednář, Miloslav Chytráček, David Vích, Tomáš Zavoral, Zuzana Mírová, Libor Petr, Jaromír Kovárník, Peter Milo, and Lukáš Kučera. 2021. 'The Oldest Millet Herbal Beer in Europe? The Ninth Century BCE Bronze Luxury Bucket from Kladina, Czech Republic', *Archaeometry*, 64.2: 454–67

Jockenhövel, Albrecht. 2016. '50 Jahre "Prähistorische Bronzefunde" Versuch einer Ersten Bilanz', in *50 Jahre 'Prähistorische Bronzefunde' Bilanz und Perspektiven: Beiträge zum internationalen Kolloquium vom 24. bis 26. September 2014 in Mainz*, ed. by Ute Luise Dietz and Albrecht Jockenhövel, Prähistorische Bronzefunde, 20.14 (Stuttgart: Steiner)

Kristiansen, Kristian. 1998 *Europe before History* (Cambridge: Cambridge University Press)

Kuijpers, Maikel H. G. 2018 *An Archaeology of Skill: Metalworking Skill and Material Specialization in Early Bronze Age Central Europe*, Routledge Studies in Archaeology, 29 (London: Routledge)

Knight, Matthew G. 2019. 'Going to Pieces: Investigating the Deliberate Destruction of Late Bronze Age Swords and Spearheads', *Proceedings of the Prehistoric Society*, 85: 251–72

——. 2020. 'There's Method in the Fragments: A Damage Ranking System for Bronze Age Metalwork', *European Journal of Archaeology*, 24.1: 1–20

Levy, Janet E. 1982. *Social and Religious Organization in Bronze Age Denmark: An Analysis of Ritual Hoard Finds*, British Archaeological Reports, International Series, 124 (Oxford: BAR)

Maciejewski, Marcin. 2016. *Metal — granica — rytuał: Badania nad depozytami przedmiotów metalowych w kontekście sieci osadniczej*, Archaeologia Bimaris, Monografie, 7 (Poznań: Wydawnictwo Nauka i Innowacje)

Mödlinger, Marianne, and Peter Trebsche. 2020. 'Archaeometallurgical Investigation of a Late Bronze Age Hoard from Mahrersdorf in Lower Austria', *Journal of Archaeological Science: Reports*, 33: 1–15

Nebelsick, Louis. 2000. 'Rent Asunder: Ritual Violence in Late Bronze Age Hoards', in *Metals Make the World Go Round: The Supply and Circulation of Metals in Bronze Age Europe; Proceedings of a Conference Held at the University of Birmingham in June 1997*, ed. by Christopher F. E. Pare (Oxford: Oxbow), pp. 160–75

Nørgaard, Heide W. 2018. *Bronze Age Metalwork Techniques and Traditions in the Nordic Bronze Age 1500–1100 BC* (Oxford: Archaeopress)

Nowak, Kamil, János Gábor Tarbay, Zofia A. Stos-Gale, Paweł Derkowski, and Katarzyna Sielicka. 2023. 'A Complex Case of Trade in Metals: The Origin of Copper Used for Artefacts Found in One Hoard from a Late Bronze Age Lusatian Urnfield Culture in Poland', *Journal of Archaeological Science: Reports*, 49: 1–21

Pałubicka, Anna. 1985. 'O trzech historycznych odmianach waloryzacji światopoglądowej', *Studia Metodologiczne*, 24: 51–76

Piningre, Jean-François, Michel Pernot, and Véronique Ganard. 2015. *Le dépôt d'Évans (Jura) et les dépôts de vaisselles de bronze en France au Bronze Final* (Dijon: Société Archéologique de l'Est)

Popescu, Anca-Diana, Radu Băjenaru, Marta Petruneac, Robert Sîrbu, Dumitru Hortopan, Daniela Cristea-Stan, and Mircea Lechinţan. 2020. 'The Deposition of Bronze Artefacts from Preajba Mare (Gorj County, Romania)', *Dacia*, 64: 123–41

Rezi, Botond. 2011. 'Voluntary Destruction and Fragmentation in Late Bronze Age Hoards from Central Transylvania', in *Bronze Age Rites and Rituals in the Carpathian Basin: Proceedings of the International Colloquium from Târgu Mureş 8–10 October 2010*, ed. by Sándor Berecki, Rita E. Németh, and Botond Rezi (Târgu Mureş: Mega), pp. 303–34

Sadowski, Jan Nepomucen. 1876. 'Drogi handlowe greckie i rzymskie przez porzecza Odry, Wisły, Dniepru i Niemna do wybrzeży morza baltyckiego. Rzecz czytana na posiedzeniach komisyi archeologicznej Akademii Umiejętności w Krakowie', *Pamiętniki Akademii Umiejętności w Krakowie, Wydział: Filologiczny i Historyczno-Filozoficzny*, 3: 1–88

Salaš, Milan. 1997. *Der urnenfelderzeitliche Hortfund von Polešovice* (Brno: Moravské Zemské Muzeum)

Schumacher, Karl. 1903. 'Die bronzezeitlichen Depotfunde Südwestdeutschlands', *Correspondenz-Blatt der Deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte*, 34: 90–101

Soroceanu, Tudor. 1995. 'Die Fundumstände bronzezeitlicher Deponierungen – Ein Beitrag zur Hortdeutung beiderseits der Karpaten', in *Bronzefunde aus Rumänien*, ed. by Tudor Sorceanu, Prähistorische Archäologie in Südosteuropa, 10 (Berlin: Spiess), pp. 15–80

Soroceanu, Tudor, Botond Rezi, and Rita E. Németh. 2017. *Der Bronzedepotfund von Bandul de Câmpie, jud. Mureş/ Mezőbánd, Maros-Megye: Beiträge zur Erforschung der spätbronzezeitlichen Metallindustrie in Siebenbürgen*, Universitätsforschung zur prähistorischen Archäologie, 307 (Bonn: Habelt)

Tarbay, János Gábor, Boglárka Maróti, Zoltán Kis, György Káli, and László Szentmiklósi. 2021. 'Non-destructive Analysis of a Late Bronze Age Hoard from the Velem-Szent Vid Hillfort', *Journal of Archaeological Science*, 127: 1–25

Tarbay, János Gábor, Boglárka Maróti, Zoltán Kis, György Káli, and Bence Soós. 2023. 'Re-evaluation of the Late Bronze Age "Warrior Equipment" from the Collection of the Ministry of Defence, Military History Institute and Museum, Hungary', *Journal of Archaeological Science: Reports*, 51: 1–22

V. Szabó, Gábor. 2019. *Bronzkori kincsek Magyarországon: Földbe rejtett fegyverek, eszközök, ékszerek nyomában*, Hereditas archaeologica Hungariae, 3 (Budapest: Archaeolingua Fundation)

Vachta, Tilmann. 2016. *Bronzezeitliche Hortfunde und ihre Fundorte in Böhmen*, Topoi — Berlin Studies of the Ancient World, 33 (Berlin: Topoi)

Valera, António Carlos (ed.). 2019. *Fragmentation and Depositions in Pre and Proto-historic Portugal (Lisbon, 14 October 2017)* (Lisbon: Núcleo de deinvestigação arqueológica (NIA) era arqueologia s.a.)

Weihs, Andreas. 2004. *Der urnenfelderzeitliche Depotfund von Peggau (Steiermark)*, Universitätsforschungen zur prähistorische Archäologie, 114 (Bonn: Habelt)

Wiseman, Rob. 2018. 'Random Accumulation and Breaking: The Formation of Bronze Age Scrap Hoards in England and Wales', *Journal of Archaeological Science*, 90: 39–49

2. In an Interpretive Triangle

Main Trends in Research on Hoards in the Nineteenth and Twentieth Centuries: A Central European Perspective

▾ **ABSTRACT** The publications of the interwar period reveal three main directions of interpreting the Bronze and Early Iron Age hoards in Central Europe: economic, cult, and political. Subsequent studies on this subject always refer to these three perspectives. Since the 1980s, a fourth perspective has been explored, and refers to prestigious behaviour.

▾ **KEYWORDS** Bronze and Early Iron Age, hoards, interpretations, economics, cult, political events, prestigious behaviour

The history of research into Bronze Age and Early Iron Age hoards in Europe goes back 150 years. This text deals with the lines of interpretation present in the archaeology of Central European countries, where views published in German literature were particularly influential. These views were taken up and adapted to varying degrees by archaeologists from other countries. This paper also takes a subjective view of the issue from the perspective of research on the prehistory of the Polish lands. This area in the Bronze Age remained under the influence of metallurgical centres from the western part of Central Europe (mainly the upper Danube Basin), the Carpathian Basin, and the Nordic cultural area, and over time that influence changed, regarding both its sources and its intensity.

Beginnings — A Relative Balance of Views

Reading studies on the history of research (e.g., Geißlinger 1983; Rittershofer 1984, 150–77; Distelberger 1986; Sommerfeld 1994, 5–9, 21–33) leads to the conclusion that the views prevalent among Central European amateurs and the first professional archaeologists of the second half of the nineteenth century considered hoards — especially mass deposits of bronze artefacts — to be related to broadly understood economic phenomena like increased wealth or the specific activity of craftsmen and merchants. In some cases, such finds were held up as evidence of long-distance commercial activity of Mediterranean civilizations, e.g., the Etruscans, as once proposed by Sadowski (1876), aimed at contacts with the inhabitants of Central and Northern Europe, or — in a slightly different order of inference — their distribution was used as a basis for determining the course of prehistoric trade routes, an approach sometimes still used today.

In Northern Europe, on the other hand, hoards were more frequently regarded in terms of sacrifices made to deities, other spiritual beings, or supernatural forces. The names mentioned in this context in publication reviews are, in particular, those of Danish archaeologists Worsaae (1866) and Müller (1897–1898). In Central Europe, such opinions were less pronounced.

An important moment in the development of interpretations regarding the reasons for depositing

Wojciech Blajer • Instytut Archeologii, Uniwersytet Jagielloński (wojciech.blajer@uj.edu.pl), ORCID 0000-0000-0002-5606-3292

Hoards from the European Bronze and Iron Ages: Current Research and New Perspectives, ed. by Marcin Maciejewski, János Gábor Tarbay, and Kamil Nowak, NAA, 4 (Turnhout, 2024), pp. 21–29.
BREPOLS PUBLISHERS DOI 10.1484/M.NAA-EB.5.142434

hoards was the publication of an article by Reinecke (1930), in which this eminent researcher of the Bronze Age articulated a view that was probably shared by many of his contemporary prehistorians — although not often with such clearly formulated reflections and conclusions. Reinecke drew attention to the high material value of the deposited bronze objects and assumed that leaving them must have resulted from circumstances that prevented the owners from returning to the hidden goods. From there, it was only a step to interpreting hoards as the consequences and testimony of dramatic events of a military or, more generally, political nature. At the same time, such reasoning provided practical tools to indicate regions and times of particular intensification of unrest and thus to reconstruct important elements of socio-political history which are difficult to grasp in any other way. Reinecke's view was characteristic of a man from the turn of the nineteenth and twentieth centuries, who assessed the world and the past from the perspective of the currently dominant principles and ideas, especially material benefit, as the basic rationale behind human actions. Given the current state of knowledge about the economics of archaic societies, it must be said that this approach was too simplistic and not necessarily accurate.

Summing up, the publications of the interwar period reveal three main directions of interpreting hoards, a phenomenon particularly characteristic of the Bronze Age. They can be conventionally and briefly described as economic, cult, and political. Subsequent studies on this subject always refer, to varying degrees, to these three perspectives, typically with a clear preference for one of them.

It is worth noting that many archaeologists active in the first half of the twentieth century — outstanding experts in both source materials and the processes of cultural change and obviously limited by the state of the source basis and research at the time — hardly ever commented on the interpretation of hoards. We can mention such figures as Seger (e.g., 1936) and Sprockhoff (e.g., 1956) in Germany and Kostrzewski (e.g., 1964) in Poland. They analysed various typological and chronological aspects, as well as regional and cultural relationships between various types of object or entire assemblages. As a result of the association of cultures with specific peoples, widely accepted at the time, hoards were also used in discussions on ethnic issues (e.g., Kostrzewski 1958).

The Period after the Second World War — The Isolation of Research Trends

The political division of Central Europe in the aftermath of World War II also had consequences for the research activity in those countries that found themselves in the Eastern Bloc. Of the three main lines of hoard interpretation mentioned above, the determinants arising from the spiritual sphere of culture were often minimized by Eastern European scholars. It remains a separate question the degree to which this resulted from censorship imposed from the outside, and how much from a kind of self-censorship or simply from the withdrawal of many archaeologists to the safer ground of typological-chronological analyses and seemingly neutral economic interpretations.

Among Polish publications of the 1950s, Szafrański's (1955, 23–31, 39–41, 45, 50) work on hoards and stray bronze finds from the Bronze Age Periods IV and V in Greater Poland stands out favourably. The author indicated a number of interpretative possibilities. He pointed to internal struggles as a possible reason for burying hoards and explained concentrations of finds, sometimes observable in the border zones of cultural units, as an effect of mercantile contacts, especially lively in these areas. He did not ignore cult reasons either, especially with regard to finds from peat bogs, swamps, and other bodies of water. He also addressed the impact of bronze objects and hoards on social differentiation and the breakdown of the ancestral community. It was the first and, for the next few decades, the last work in Polish archaeological literature to discuss these issues from such a wide perspective.

The same year saw the publication of an important paper by Hundt (1955), who drew attention to a specific aspect of interpretations related to the spiritual sphere of culture. Proceeding from observations concerning the southern range of the Nordic culture, Hundt argued that in Bronze Age Periods III–IV, with the spread of the cremation rite, metal objects that had previously been deposited primarily in graves, came to be increasingly frequently deposited in other places (especially in aquatic environments), which means formally as hoards, but in fact, destined for the dead as *Totenausstattung* (an offering in place of a grave offering). Evidence for the existence of such a custom (to bury certain objects for themselves), is known from a later — early medieval — tradition of the northern Germanic (Scandinavian) peoples and is referred to as *Selbstausstattung* (self-equipment).

While it was adopted and discussed in the German scholarly community, this hypothesis failed to resonate in the research and publications of archaeologists from the countries of Eastern-Central Europe, where the dominant interpretations perceived hoards as a manifestation of various aspects of economic activity (hoarding of surpluses, with considerations for individual and collective property, and a link with the activities of people particularly related to production and distribution, i.e., craftsmen and merchants), and

less often of possible political unrest. This approach was represented by, among others, Gedl (1961, 14, 58, 60) in his study on the economy of the Lusatian culture in southern Poland and Sarnowska (1969, 41–42, 111) in relation to the earlier Únětice culture in western Poland.

Trudzik's (1967) review of a paper by Grenz (1962) was an isolated phenomenon in Polish archaeological literature. In a paper published in a niche German journal, Grenz (1962) had tried to apply Hundt's hypothesis to the changes observable in the occurrence of hoards in Silesia. The reviewer's opinion was definitely critical, and the issue has never been returned to. Voices pointing to the role of causes rooted in the spiritual sphere of culture were relatively rare and usually not developed further. This makes all the more unique some remarks by Łuka (1983, 21–33), allowing for the possibility of cult reasons for deposits from the end of the Bronze Age and the Early Iron Age in eastern Pomerania.

A special situation can be observed in Hungarian archaeology. The Carpathian is a zone of numerous bronze hoards, a large part of which can be divided chronologically. This gave rise to distinguishing a number of typological-chronological groups (horizons) of hoards, especially in Hungary. The main direction of the interpretation there was to emphasize political causes, including migrations and the unrest related to them. This approach was taken by Mozsolics (1957; 1967; 1973; 1985; 1987) in particular, and to a lesser extent by Kemenczei (1984). Their publication in German meant they reached a broader audience, and as a result, this view remained dominant for several decades, inspiring archaeologists from other Central European countries, including Poland (Gardawski 1971; Dąbrowski 1972; Blajer and Szpunar 1982). While referring more or less to those in Hungary, horizons or series of hoards distinguished in neighbouring countries, especially Slovakia (e.g., Novotná 1970) and Romania (Petrescu-Dîmboviţa 1977), no longer carried such clear accents referring to the political events of the Bronze Age.

It is also worth noting that not all archaeologists followed the same approach to the problems discussed here throughout their entire research activity. An interesting example is the development of the views of von Brunn, often credited with coining the classic definition of a bronze hoard (von Brunn 1959, VII). Four important works can be mentioned here, which illustrate well a certain evolution in his attitude towards the phenomenon of hoards. In an early article on a large find of sickles and axes (palstaves) from Frankleben in Saxony-Anhalt, von Brunn (1958) focused on technical issues and emphasized interpretations related to the workshop of a craftsman-metallurgist. In a volume devoted to the Early Bronze Age hoards in central Germany, he paid much attention to the history of discoveries and the critical analysis of sources, as well as to typology (von Brunn 1959). A two-volume work on Middle Bronze Age hoards from the same region presents reflections on typology and chronology in a broad Central European context, along with important remarks on sets (*Garnituren*) of dress items and ornaments, which are a particular reflection of social phenomena (manifestation of identity) visible in hoard inventories, and certain statements concerning the importance of the diversity of sources containing bronze objects, and finally about the sacred nature of bronze as a metal (von Brunn 1968). The last publication is an extensive article about hoards from the Bronze Age Period V in the areas stretching along the southern shores of the Baltic Sea. The frequent presence of dress items and ornaments, as well as elements of horse tack, led the author to cautiously propose that some of these deposits might be a material remnant of rituals attended mainly by females, in which a horse played a role. Objects used in these rites were excluded from further use and buried as hoards (von Brunn 1981). So, this is a visible development of interpretation from an economic approach to a cult approach.

On the margins of the mainstream, works were also published discussing certain possible religious conditionings behind depositing bronze items. One good example is an article on finds of weapons from rivers in areas which were settlement and cultural borderlands, no-man's lands determined to be places where certain taboo items were deposited (Lavrsen 1982).

Among the works of the 1970s, a two-volume publication by Stein (1976; 1979) is undoubtedly significant. It concerned southern Germany but raised issues important for the research on the Bronze Age in the neighbouring countries of Switzerland, (eastern) France, Austria, and the Czech Republic. Among other things, the author attempted to define the characteristics of secular hoards hidden temporarily to be recovered later, and cult hoards, offerings not meant to be recovered.

Another important publication was Levy's (1982) study on Danish hoards from the Early Bronze Age. Its special advantage is the use of ethnographic analogies. The author's findings found an echo in German archaeology. At the same time, in the countries of Eastern-Central Europe, their reception was delayed and limited, probably mainly due to the greater geographical distance and the resulting cultural differences.

The 1980s: The Growing Role of Cult Interpretations

The first half of the 1980s was particularly rich in publications in the German archaeological community. Views emphasizing the cult determinants of hoard

depositing in the Bronze Age became clearly prevalent at that time. A role may have been played here by Rech's (1979) study on Eneolithic deposits from selected regions of northern Germany and southern Scandinavia, in which the author draws attention to a number of situations proving the existence of rules regarding the intentional choice of objects and the place and manner of their deposition.

Apart from the important paper by von Brunn (1981) mentioned above, we should mention Rittershofer's (1984) study on the southern German hoards from Bühl and Ackenbach, where (apart from chronological issues, the problem of the BrA2/B1 phase — otherwise: BrA3), much attention was paid to interpretation. Rittershofer presented a broad discussion of the views held so far, critically assessing interpretations emphasizing causes of a political nature. He proposed interpreting mass finds of mechanically or thermally damaged bronze objects or their fragments as equipment of the dead (*Totenausstattung*), according to the *pars pro toto* principle. The paper was also met with interest in other Central European countries (e.g., Blajer 1988), but Rittershofer's approach did not garner followers.

Willroth (1985b) detailed the occurrence of various categories of bronze artefacts in selected regions of the Nordic cultural area. His work was made possible by excellent source publications from Denmark (Aner and Kersten *Die Funde der älteren Bronzezeit des nordischen Kreises in Dänemark, Schleswig-Holstein und Niedersachsen* series) and Sweden (Oldeberg 1974; 1976). Willroth (1985b) used inductive inference based on consistently conducted mapping and statistics. As a result, he identified chronological and regional differences in the occurrence of the same categories of bronze objects in particular contexts (hoards, stray finds, dry and wet environments, graves, settlements) and thus in the way of their transition from a living culture to a dead culture — i.e., their different perceptions by individual communities within the Nordic circle, which from a broader perspective seems to be culturally homogeneous. In a separate article, he drew attention to the possibility that graphical representations of bronze objects (rock carvings) may have had meanings similar to those of the objects themselves (Willroth 1985a).

A series of papers published in *Archäologisches Korrespondenzblatt* (volume 15, 1985) provides many interesting statements in response to some of the conclusions emerging from Menke's (1982) study on the hoards from the upper and middle Danube Basin. These papers include a number of detailed works, as well as a methodological article by Kubach (1985), which raises the possibility of interpreting the so-called single finds as intentional deposits of single objects. Yet another is the tenor of Pauli's (1985) general study, which draws attention to the frequently observed cyclical regularity: hoards are relatively few in cultural traditions with more elaborate grave constructions and richer furnishing of graves with metal products (Tumulus circle, Hallstatt circle), while in those with relatively poor furnishings and modest grave structures, the phenomenon of depositing bronze objects in hoards is more pronounced (Únětice-Straubing circle, Urnfield circle).

Statements concerning hoards, the multifaceted nature of this issue, and the discussions around it find a complement in the extensive entry in *Reallexikon der germanischen Altertumskunde* (Geißlinger 1983). Its author underlines intentionality as the basic defining feature of 'deposit', as it is broadly understood, and reminds us that we are dealing with finds of this kind, at least from the Upper Palaeolithic until the most recent times.

Important observations and reflections appeared scattered throughout various works, such as a review paper by Mandera (1983), who emphasized the possibility that hoard deposition may have been driven by several reasons simultaneously.

Around the same time, works of the Danish prehistorian Kristiansen (e.g., 1984; 1986), who drew attention to the relationship between cult and social factors, started to gain wider recognition. His views became especially popular among German scholars, although their adoption concerned the conclusions rather than methods. Despite being written from a Marxist perspective, his publications initially did not meet with a broader reception in the countries of Central and Eastern Europe, including Poland, where they were noticed only after a certain delay.

Among the views expressed by archaeologists from the countries of Eastern-Central Europe, the publications of Horst (e.g., 1978) are noteworthy. The methodology and terminology applied in his works is also characteristic of the Marxist approach to economic processes and social phenomena in prehistory.

In the early 1990s, Sommerfeld (1994) published a study which marked a kind of culmination of the trends dominating the German literature of the 1980s. He applied the deductive method. He accepted a single reason behind depositing hoards (the cult one, with hoards as gifts to the gods, on the *do ut des* principle) and emphasized the role of commodity money (necklaces, axes, sickles, and scrap metal) in transactions between humans and gods. This very one-sided approach and the deductive method of reasoning were both met with criticism from, for example, Primas (1997), and many other researchers from German research centres approached his views with great scepticism. Some centres, however, like the 'Berlin School', showed a tendency to unreflectively accept Sommerfeld's proposals, as evidenced by the volume *Gaben an die Götter* (Hänsel and Hänsel 1997).

Hansen is the author of two important books (1991; 1994) and numerous articles (e.g., 1995) on hoards, works characterized by in-depth typological and chronological analysis combined with data from religious studies. Another important aspect of his studies is the attention paid to the type of contexts in which bronze objects occur and, thus to the transition from a living culture to a buried one. Hansen's works are also important in bringing to light the pan-European community of ideas and certain features of culture, especially those related to the elites of the time.

The works of Sommerfeld (1994) and Hansen (e.g., 1991; 1994; 1995) in the 1990s marked the end of a certain stage in the history of German, and more broadly, Central European, studies on bronze hoards. Against their background, the subsequent discussion in German literature seems to be relatively shallow, bringing no more significant findings or proposals.

Prestigious Behaviour: The Fourth Perspective?

Bradley's (1990) study stands out very favourably against the background of the relatively one-sided Central European interpretations dominating the second half of the twentieth century. At that time, the latter emphasized various ways of understanding hoards, such as the possibilities of cult interpretations (western Germany, Scandinavia), sometimes in connection with social (e.g., Kristiansen 1984), economic (eastern part of Central Europe), or political factors (especially in Hungary). Bradley's was an important voice from the other side of the English Channel, one that was not limited to examples from the British Isles but also took into account a range of continental situations. He presented the phenomenon of hoards in a broader time frame (from the Neolithic to the La Tène period) without advocating any single line of interpretation, and emphasized the impact of geographical and historical circumstances on the interpretation of hoards in various regions of Europe. In his discussion of votive deposits, Bradley drew attention to the important distinction between 'offering' (of a dead substance) and 'sacrifice' (of a substance from a living being). He also addressed the issue (noticed by other scholars) of differences in the perception of bronze objects and entire hoards between the centres and peripheries of areas inhabited by prehistoric communities.

Bradley (1990) emphasized the importance of prestigious rivalry and the specific features of the economics of primitive (archaic) communities, relying mainly on the observations and findings of cultural anthropology (e.g., Sahlins 1974; Gregory 1980; 1982). In this way, his studies provided well-grounded confirmation for certain approaches, especially those introduced by Kristiansen. Turning the spotlight onto aspects of social culture such as prestige and social rank can be seen as breaking the interpretative paradigm of Central European archaeology. The triad of the three traditionally accepted and discussed categories of the causes of the phenomenon of hoards — economic, political, and cult — was thus enriched with one more perspective.

Bradley's (1990) work was relatively quickly appreciated by many Central European archaeologists as well.

The publications from the early 1990s and the fall of the Iron Curtain triggered a certain revival of discussion in Polish archaeological literature. Initially, these were mainly works of a secondary nature, such as papers by Ostoja-Zagórski (1992) on the importance of bronze and the role of the elite, Blajer (1992) on research on hoards from the Early Iron Age, and Mogielnicka-Urban (1997), who presented the first comprehensive review of the issue of hoard interpretation, also summing up the current state of research at that time. A special place is occupied by the innovative works of Woźny (1996; 1997), including a book and a paper on deposits from aquatic environments. Among others, Woźny addressed such issues as the 'aquatic epiphany' and the 'Apollonian' and 'Dionysian' models of culture and behaviour that led to the depositing of hoards. It is the first work in Polish archaeological literature with such broad references to the findings of religious studies.

Blajer's book of 2001 can be regarded as a summary of a certain stage of research on the interpretation of hoards in the Polish archaeological literature. It is an attempt to carry out analyses using methods referring to Willroth's study (1985b). The application of Blajer's (2001) results is unfortunately hampered by the cultural specificity of the lands in the Oder and Vistula Basins, which were first peripheral to the cultural centres of the Early Bronze Age, then culturally heterogeneous and subject to influences from various directions. Despite a number of detailed observations, the general conclusion was cautious and limited to suggestions about a much greater role of the cult determinants than assumed in the earlier works of Polish authors.

Perspectives?

One of the research directions followed today in Central Europe puts emphasis on the places where hoards were discovered and the arrangement of bronze objects. Particularly noteworthy in this context are the achievements of Soroceanu, the author of a number of works and the editor of collective publications (e.g., Soroceanu 1995), which raised the awareness of archaeologists working in the northern part of Central

Europe about the discoveries made in the Carpathian Basin, especially in Romania.

Another approach shared by archaeologists from various Central European countries is the study of damaged and broken objects and detailed analysis of various aspects of the phenomenon. The emphasis is on interpretations that draw attention to the symbolism of broken items, usually perceived in the context of spiritual culture (e.g., Rezi 2011).

In turn, in some Western European archaeological centres, special emphasis has been placed for several decades on studies on the repeatability of hoard composition and selection of places ('patterns of deposition'), as well as on hoards in the context of the 'sacrificial landscape' (e.g., Fontijn 2002), providing inspiration for similar research in Central Europe.

A book by Maciejewski (2016) summarizing some previous studies, findings, and proposals, and pointing to new directions and research methods for the upcoming decades, is of significant importance to Polish and Central European archaeology. Its introductory chapters provide an extensive discussion of a number of issues, including symbolism, while detailed analyses were carried out taking into account the identified settlement structures, and these allow for a well-argued thesis that some of the hoards could have been deposited as an aspect of space sacralization rituals. It is thus considered a specific combination of cult and social reasons but presented in a novel way. Maciejewski's studies also lead to the conclusion that at least some of the deposits were probably buried in an open or even ostentatious manner. This, in turn, forces us to revise and correct the associations that the very concept of 'hoard' has evoked for centuries.

Currently, relatively little attention is paid in Central European archaeology to the problems of hoard interpretation, especially in comparison with, say, the 1980s. However, the research in this area is now more multifaceted, taking into account a wide range of possible economic, social, and cult determinants, as well as the relationship with the surrounding landscape. References to the findings of cultural anthropology and religious studies are a constant feature. Interpretations referring to the role of political reasons remain in the background. However, they should not be completely disregarded, as evidenced, for example, by the discoveries made by Hungarian archaeologists in fortified settlements of the late Bronze Age (e.g., Szabó 2011). The diverse approach and the choice of interpretation optics depend largely on regional, chronological, and cultural specificity, but they are still significantly influenced by subjective factors: the professional preparation, knowledge, and personal attitudes of researchers.

Works Cited

Blajer, Wojciech. 1988. 'Karl-Fredrich Rittershofer: Der Hortfund von Bühl und seine Beziehungen' (review), *Sprawozdania Archeologiczne*, 34: 370–75

——. 1992. 'Ze studiów and skarbami okresu halsztackiego w Polsce', in *Ziemie polskie we wczesnej epoce żelaza i ich powiązania z innymi terenami*, ed. by Sylwester Czopek (Rzeszów: Wydawnictwo Muzeum Okręgowe w Rzeszowie), pp. 101–10

——. 2001. *Skarby przedmiotów metalowych z epoki brązu i wczesnej epoki żelaza na ziemiach polskich* (Kraków: Księgarnia Akademicka)

Blajer, Wojciech, and Andrzej Szpunar. 1982. 'O możliwościach wydzielania horyzontów skarbów brązowych na obszarze Polski', *Archeologia Polski*, 26: 295–320

Bradley, Richard. 1990. *The Passage of Arms* (Cambridge: Cambridge University Press)

Brunn, Wilhelm Albert von. 1958. 'Der Schatz von Frankleben und die mitteldeutschen Sichelfunde', *Praehistorische Zeitschrift*, 36: 1–70

——. 1959. *Bronzezeitliche Hortfunde*, I: *Die Hortfunde der frühen Bronzezeit aus Sachsen-Anhalt, Sachsen, Thüringen*, Schriften der Sektion für Ur- und Frühgeschichte, 7 (Berlin: Akademie-Verlag)

——. 1968. *Mitteldeutsche Hortfunde der jüngeren Bronzezeit*, Römisch-Germanische Forschungen, 29 (Berlin: De Gruyter)

——. 1981. 'Eine Deutung spätbronzezeitlicher Hortfunde zwischen Elbe und Weichsel', *Bericht der Römisch-Germanischen Kommission*, 61: 91–150

Dąbrowski, Jan. 1972. *Powiązania ziem polskich z terenami wschodnimi w epoce brązu* (Wrocław: Zakład Narodowy imienia Ossolińskich)

Distelberger, Anton. 1986. 'Der jüngerurnenfelderzeitliche Depotfund vom "Gelände" bei Grünbach am Schneeberg, NÖ', *Mitteilungen der Österreichischen Arbeitsgemeinschaft für Ur- und Frühgeschichte*, 36: 71–96

Fontijn, David R. 2002. 'Sacrificial Landscapes: Cultural Biographies of Persons, Objects and "Natural" Places in the Bronze Age of the Southern Netherlands, *c.* 2300–600 BC', *Analecta praehistorica leidensia*, 33–34: 1–392

Gardawski, Aleksander. 1971. 'Zagadnienie fazy łódzkiej', *Archeologia Polski*, 16: 151–66

Gedl, Marek. 1961. *Uwagi o gospodarce i strukturze społecznej ludności kultury łużyckiej w południowej Polsce*, Zeszyty Naukowe Uniwersytetu Jagiellońskiego. Rozprawy i Studia, 32 (Kraków: Państwowe Wydawnictwo Naukowe Oddział w Krakowie)

Geißlinger, Helmut. 1983. 'Depotfund', in *Reallexikon der germanischen Altertumskunde*, V, ed. by Johannes Hoops (Berlin: De Gruyter), pp. 320–38

Gregory, Chris A. 1980. 'Gifts to Men and Gifts to Gods: Gift Exchange and Capital Accumulation in Contemporary Papua', *Man*, 15: 628–52

——. 1982. *Gifts and Commodities* (London: Academic Press)

Grenz, Rudolf. 1962. 'Die bronzezeitlichen Hortfunde in Schlesien', *Zeitschrift für Ostforschung, Länder und Völker im östlichen Mitteleuropa*, 11: 41–89

Hänsel, Alix, and Bernhard Hänsel (eds). 1997. *Gaben an die Götter: Schätze der Bronzezeit Europas*, Bestandskataloge des Museums für Vor- und Frühgeschichte, 4 (Berlin: Museum für Vor- und Frühgeschichte)

Hansen, Svend. 1991. *Studien zu den Metalldeponierungen während der Urnenfelderzeit im Rhein-Main-Gebiet*, Universitätsforschungen zur Prähistorischen Archäologie, 5 (Bonn: Habelt)

——. 1994. *Studien zu den Metalldeponierungen während der älteren Bronzezeit zwischen Rhônetal und Karpatenbecken*, Universitätsforschungen zur Prähistorischen Archäologie, 21 (Bonn: Habelt)

——. 1995. 'Aspekte des Gabenaustausches und Handels während der Urnenfelderzeit in Mittel- und Nordeuropa im Lichte der Fundüberlieferung', in *Handel, Tausch und Verkehr im bronze- und früheisenzeitlichen Süddosteuropa*, ed. by Bernhard Hänsel, Süddosteuropa-Schriften, 17; Prähistorische Archäologie in Südosteuropa, 11 (Munich: Südosteuropa-Gesellschaft), pp. 67–80

Horst, Fritz. 1978. 'Die jungbronzezeitlichen Stämme im nördlichen Teil der DDR', in *Mitteleuropäische Bronzezeit: Beiträge zur Archäologie und Geschichte*, ed. by Werner Coblenz and Fritz Horst (Berlin: Akademie-Verlag), pp. 137–87

Hundt, Hans-Jürgen. 1955. 'Versuch zur Deutung der Depotfunde der nordischen jüngeren Bronzezeit unter besonderer Berücksichtigung Mecklenburgs', *Jahrbuch des Römisch-Germanischen Zentralmuseums*, 2: 95–140

Kemenczei, Tibor. 1984. *Die Spätbronzezeit Nordostungarns*, Archaeologia hungarica, 51 (Budapest: Akadémiai Kiadó)

Kostrzewski, Józef. 1958. *Kultura łużycka na Pomorzu*, Poznańskie Towarzystwo Przyjaciół Nauk, Wydział Historii i Nauk Społecznych, Prace Komisji Archeologicznej, 3 (Poznań: Państwowe Wydawnictwo Naukowe)

——. 1964. 'Skarby i luźne znaleziska metalowe od eneolitu do wczesnego okresu żelaza z górnego i środkowego dorzecza Wisły i górnego dorzecza Warty', *Przegląd Archeologiczny*, 15: 5–133

Kristiansen, Kristian. 1984. 'Ideology and Material Culture: An Archaeological Perspective', in *Marxist Perspectives in Archaeology*, ed. by Matthew Spriggs (Cambridge: Cambridge University Press), pp. 72–100

——. 1986. 'Ideologie und Gesellschaft während der Bronzezeit in Südskandinavien', *Veröffentlichungen des Museum für Ur- und Frühgeschichte Potsdam*, 20: 303–07

Kubach, Wolf. 1985. 'Einzel- und Mehrstückdeponierungen und ihre Fundplätze', *Archäologisches Korrespondenzblatt*, 15: 179–85

Lavrsen, Jytte. 1982. 'Weapons in Water. A European Sacrificial Rite in Italy', *Analecta Romana Instituti Darici*, 11: 7–25

Levy, Janet E. 1982. *Social and Religious Organization in Bronze Age Denmark: An Analysis of Ritual Hoard Finds*, British Archaeological Reports, International Series, 124 (Oxford: BAR)

Łuka, Leon Jan. 1983. 'Kształtowanie się osadnictwa na Pomorzu Wschodnim na przełomie epoki brązu i żelaza', *Pomorania antiqua*, 11: 7–29

Maciejewski, Marcin. 2016. *Metal – granica – rytuał: Badania and depozytami przedmiotów metalowych w kontekście sieci osadniczej*, Archaeologia Bimaris. Monografie, 7 (Poznań: Wydawnictwo Nauka i Innowacje)

Mandera, Heinz-Eberhard. 1983. 'Frauke Stein. Bronzezeitliche Hortfunde in Süddeutschland. Beiträge zur Interpretation einer Quellengattung' (review), *Praehistorische Zeitschrift*, 58: 141–45

Menke, Manfred. 1982. 'Studien zu den frühbronzezeitlichen Metalldepots Bayerns', *Jahresbericht der Bayerischen Bodendenkmalpflege*, 19–20: 5–305

Mogielnicka-Urban, Małgorzata. 1997. 'Uwagi w sprawie interpretacji zbiorowych i pojedynczych znalezisk przedmiotów brązowych', in *Beiträge zur Deutung der bronzezeitlichen Hort- und Grabfunde in Mitteleuropa*, ed. by Wojciech Blajer (Kraków: Oficyna Cracovia), pp. 17–32

Mozsolics, Amália. 1957. 'Archäologische Beiträge zur Geschichte der Großen Wanderung', *Acta archaeologica Academiae scientiarum Hungaricae*, 8: 119–56

——. 1967. *Bronzefunde des Karpatenbeckens: Depotfundhorizonte von Hajdúsámson und Kosziderpadlás* (Budapest: Akadémiai Kiadó)

——. 1973. *Bronze- und Goldfunde des Karpatenbeckens: Depotfundhorizonte von Forró und Ópályi* (Budapest: Akadémiai Kiadó)

——. 1985. *Bronzefunde aus Ungarn: Depotfundhorizonte von Aranyos, Kurd und Gyermely* (Budapest: Akadémiai Kiadó)

——. 1987. 'Verwahr- oder Opferfunde? Bemerkungen zur Arbeit von K.-H. Willroth, Die Hortfunde der älteren Bronzezeit in Südschweden und auf den dänischen Inseln' (review), *Acta archaeologica Academiae scientiarum Hungaricae*, 39: 93–98

Müller, Sophus. 1897–1898. *Nordische Altertumskunde nach Funden und Denkmälern aus Dänemark und Schleswig*, 2 vols (Strassburg: Trübner)

Novotná, Mária. 1970. *Die Bronzehortfunde in der Slowakei: Spätbronzezeit*, Archaeologica Slovaca Fontes Instituti Archaeologici Nitriensis Academiae Scientiarum Slovacae, 9 (Bratislava: Vydavateľstvo Slovenskej Akadémie Vied)

Oldeberg, Andreas. 1974, 1976. *Die ältere Bronzezeit in Schweden*, 2 vols (Stockholm: Kungl. Vitterhets Historie och Antikvitets Akademien)

Ostoja-Zagórski, Janusz. 1992. 'Wymiana i jej rola w pradziejach Europy Środkowej na przykładzie epoki brązu', *Kwartalnik Historii Kultury Materialnej*, 40.1: 119–35

Pauli, Ludwig. 1985. 'Einige Anmerkungen zum Problem der Hortfunde', *Archäologisches Korrespondenzblatt*, 15: 195–206

Petrescu-Dîmboviţa, Mircea. 1977. *Depozitele de Bronzuri din România* (Bucharest: Editura Academiei Republicii Socialiste România)

Primas, Margareta. 1997. 'Ch. Sommerfeld. Gerätegeld Sichel' (review), *Germania*, 75: 343–46

Rech, Manfred. 1979. *Studien zu Depotfunden der Trichterbecher- und Einzelgrabkultur des Nordens*, Offa-Bücher, 39 (Neumünster: Wachholtz)

Reinecke, Paul. 1930. 'Die Bedeutung der Kupferbergwerke der Ostalpen für die Bronzezeit Mitteleuropas', in *Schumacher-Festschrift: Zum 70. Geburtstag Karl Schumachers*, ed. by Direktion des Römisch-Germanischen Zentralmuseums in Mainz (Mainz: Wilckens), pp. 107–15

Rezi, Botond. 2011. 'Voluntary Destruction and Fragmentation in Late Bronze Age Hoards from Central Transylvania', in *Bronze Age Rites and Rituals in the Carpathian Basin: Proceedings of the International Colloquium from Târgu Mureş 8–10 October 2010*, ed. by Sándor Berecki, Rita E. Németh, and Botond Rezi, Bibliotheca Mvsei Marisiensis, Seria archaeologica, 4 (Târgu Mureş: Mega), pp. 303–34

Rittershofer, Karl-Friedrich. 1984. 'Der Hortfund von Bühl und seine Beziehungen', *Bericht der Römisch-Germanischen Kommission*, 64: 139–415

Sadowski, Jan Nepomucen. 1876. 'Drogi handlowe greckie i rzymskie przez porzecza Odry, Wisły, Dniepru i Niemna do wybrzeży morza Bałtyckiego. Rzecz czytana na posiedzeniach Komisji archeologicznej', *Pamiętnik Akademii Umiejętności w Krakowie, Wydziały: Filologiczny i Historyczno-Filozoficzny*, 3: 1–88

Sahlins, Marshall. 1974. *Stone Age Economics* (New York: De Gruyter)
Sarnowska, Wanda. 1969. *Kultura unietycka w Polsce*, 1 (Wrocław: Zakład Narodowy imienia Ossolińskich)
Seger, Hans. 1936. 'Schlesische Hortfunde aus der Bronze- und frühen Eisenzeit', *Altschlesien*, 6: 85–182
Sommerfeld, Christoph. 1994. *Gerätegeld Sichel: Studien zur monetären Struktur bronzezeitlicher Horte im nördlichen Mitteleuropa*, Vorgeschichtliche Forschungen, 19 (Berlin: De Gruyter)
Soroceanu, Tudor (ed.). 1995. *Bronzefunde aus Rumänien*, Prähistorische Archäologie in Südosteuropa, 10 (Berlin: Spiess)
Sprockhoff, Ernst. 1956. *Jungbronzezeitliche Hortfunde der Südzone des Nordischen Kreises (Periode V)*, Kataloge des Römisch-Germanischen Zentralmuseums zu Mainz, 16 (Mainz: Verlag des Römisch-Germanischen Zentralmuseums)
Stein, Frauke. 1976. *Bronzezeitliche Hortfunde in Süddeutschland: Beiträge zur Interpretation einer Quellengattung*, Saarbrücker Beiträge zur Altertumskunde, 23 (Bonn: Habelt)
——. 1979. *Katalog der vorgeschichtlicher Hortfunde in Süddeutschland*, Saarbrücker Beiträge zur Altertumskunde, 24 (Bonn: Habelt)
Szafrański, Włodzimierz. 1955. *Skarby brązowe z epoki wspólnoty pierwotnej (IV I V okres epoki brązowej) w Wielkopolsce*, Polskie Towarzystwo Archeologiczne, Biblioteka Archeologiczna, 6 (Warsaw: Zakład imienia Ossolińskich — Wydawnictwo)
Trudzik, Zbigniew. 1967. 'R. Grenz. Die bronzezeitlichen Hortfunde in Schlesien' (review), *Silesia Antiqua*, 9: 271–76
V. Szabó, Gábor. 2011. 'Spätbronzezeitliche Bronzehortfunde im Siedlungskontext – Neue Forschungsergebnisse aus Ostungarn', in *Bronze Age Rites and Rituals in the Carpathian Basin: Proceedings of the International Colloquium from Târgu Mureş 8–10 October 2010*, ed. by Sándor Berecki, Rita E. Németh, and Botond Rezi, Bibliotheca Mvsei Marisiensis, Seria archaeologica, 4 (Târgu Mureş: Mega), pp. 303–56
Willroth, Karl-Heinz. 1985a. 'Aspekte älterbronzezeitlicher Deponierungen im südlichen Südskandinavien', *Germania*, 63: 361–400
——. 1985b. *Die Hortfunde der älteren Bronzezeit in Südschweden und auf den dänischen Inseln*, Offa-Bücher, 55 (Neumünster: Wachholtz)
Worsaae, Jens Jacob Asmussen. 1866. 'Om nogle Mosefund fra Broncealderen', *Aarbøger for nordisk Oldkyndighed og Historie*, 1866: 313–26
Woźny, Jacek. 1996. *Symbolika wody w pradziejach Polski*, Wydawnictwo Uczelniane Wyższej Szkoły Pedagogicznej w Bydgoszczy, 628 (Bydgoszcz: Wydawnictwo Uczelniane WSP w Bydgoszczy)
——. 1997. 'Symbolika depozytów wodnych z epoki brązu na Niżu Polskim', in *Beiträge zur Deutung der bronzezeitlichen Hort- und Grabfunde in Mitteleuropa*, ed. by Wojciech Blajer (Kraków: Oficyna Cracovia), pp. 33–43

3. The Cognitive Development of Prehistoric Wetland Deposition Tradition Through Mnemonics

Case Studies of Iron Age Wales and Scotland

▾ **ABSTRACT** The cognitive development of social identity, relationships, and tradition will be presented through a discussion of social learning, the generational effect, and method of *loci*. Supporting case studies from the British Iron Age will be presented from Wales and Scotland. The development of deposition tradition has directly affected how objects were handled, conceptualized, and connected with chosen wet landscapes. Likewise, hoard assemblage reflects the donating group(s) social identity and preferred method of depositional practice. Data sourced through collected object records has provided statistical patterns of regional and subregional practice from the case studies observed. These patterns have provided evidence that wetland deposition traditions were established over generations through cognitive development grounded in sensorial memory.

▾ **KEYWORDS** British Iron Age, wetland deposition, hoards, deposition practices, mnemonics

Introduction

Cognition is the process by which we absorb and process information. Formative information is gathered through external or internal processes of thought, experiences, senses, nature, and nurture. Renfrew (2009; Renfrew and Bahn 1991), supporting Hodder (1982; 1986), states that cognitive archaeology recognizes the active role of material culture and its influence in socio-cultural networks. However, we cannot consider the material culture alone but should also include the setting in which it was found. When archaeologists consider the material culture in conjunction with the landscape (i.e., wetlands), trends may be more representative of socio-cultural traditions that can be viewed in a meta-level understanding of the regional and subregional practice.

Wetlands are multifaceted arenas in prehistoric settings, exhibited through a range of evidence from settlements to production areas and resource extraction. The practice of wetland deposition has been shown to be significant and this is supported through archaeological material dating as far back as the Lithic periods in some regions of Britain.

The British Iron Age was a period of constant transition from both a cultural and environmental standpoint. Studies performed by Dark (2006) and Tipping (2002), for example, indicate that the transition

Tiffany Treadway • Pontypridd Museum (tiffany.treadway@pontypriddtowncouncil.org.uk)

Hoards from the European Bronze and Iron Ages: Current Research and New Perspectives, ed. by Marcin Maciejewski, János Gábor Tarbay, and Kamil Nowak, NAA, 4 (Turnhout, 2024), pp. 31–39.
BREPOLS PUBLISHERS DOI 10.1484/M.NAA-EB.5.142435

from the Late Bronze Age to Early Iron Age saw an increase in precipitation and a rise in water tables, and again from the Middle Iron Age transitioning into the Late Iron Age. The increase in precipitation meant that the environment in which people inhabited became increasingly wet or unstable and, in some regions, became more susceptible to extreme weather conditions (Cunliffe 2004; Dark 2006). Likewise, the Bronze Age transition to the Iron Age, as marked by Llyn Fawr typologies, shows a change in cultural expression. Further evidence of cultural shifts is present in many regions of Britain during the Late and Later Iron Age in settlement, production, and deposition sites. However, wetland deposition continued to remain a consistent form of cultural practice throughout the Iron Age in Wales and Scotland. Studies of prehistoric deposition by Bradley (1989; 1990; 2000; 2017), Knight, Boughton, and Wilkinson (2019), and Fontijn (2007; 2008) have shown topography to play a major role in the development and maintenance of social identity and memory. Therefore, the question becomes how topography and deposition practices observed from the Iron Age develop, or have developed and evolved in complexity, utilizing wetland locations as environments became increasingly wet or exposed to more volatile weather.

This chapter will explore cognitive development theories concerning prehistoric wetland deposition by utilizing varying mnemonics, with case studies from Wales and Scotland. As a large landmass separates the two regions, England, they are still considered to share many of the same cultural practices and identities and were therefore selected to show a stark comparison of practice. The study will consider the cognitive functions and purposes possibly associated with wetland deposition practice represented in social learning, generational effect, method of *loci*, and mnemonic theories supported by archaeological evidence. However, symbolism, structured religion, and cosmologies will not be examined in this discussion because these themes have been previously discussed in depth in the literature on deposition theory (e.g., Bradley 2005; Brück 2006; Chadwick 2012; Giles 2007; Hill 1996; Hingley 2006; Johns 1996; Sosis 2006; Turner 1975; Wait 1985; Whitehouse and Lanman 2014). The repetitive practice of prehistoric wetland deposition traditions is explored through a non-representational approach to cognitive development theory.

The Potential Roles of Cognition in the Development of Iron Age Depositional Traditions

Using educational psychological and sociological studies, archaeologists can begin to conceptualize how the human mind learns and adapts to its environment and society through cultural cues. Cognitive development is how individuals process and gather information which builds into more complex thought. This study fundamentally uses Piaget's (1972; 1990) approach to cognitive development in children to understand the generational evolution of tradition. Children's cognitive development can be represented in four stages (i.e., sensorimotor, pre-operational, concrete operational, and formal operational). These stages are crucial to our understanding of foundational and compounding knowledge, which children can comprehend at different stages of their lives. The stages paired with threshold development enable us to evaluate further how possible evolution and nuances of practices occurred and at what capacity. Threshold development, as stated by Cousin (2006, 4), 'We are what we know. New understandings are assimilated into our biography, becoming part of who we are, how we see and how we feel.' Features of a threshold concept are transformative, troublesome, irreversible, integrated, bounded, discursive, reconstructive, and liminal. As children develop, their adolescent minds cannot alternate in liminal spaces (interchanging between old and emerging understandings, or from child to adult) and, therefore, construct their conditions of cultural normality through mimicry (Cousin 2006, 5).

We can then surmise that tradition introduces or is inclusive of ritual. As Cousin (2006, 15) states, 'learning is the product of ritualized performances rather than integrated understandings'. However, it is important to note that depositional traditions are not always the direct result of rituals but can be the product of such behaviours. Ritual is a performance enacted through a series of customized actions and repetitious events to communicate the intentions of an individual or group(s). According to Liberman, Kinzler, and Woodward (2018, 42), rituals are often seen as having social functions because an anthropological perspective communicates collaborative symbols, transitions, experiences, and beliefs. Brück (1999, 319) states that rituals are viewed as distinct in practice, placement, time, and concept from routine activities. Consequently, archaeologists should not focus on unknown aspects of ritual (i.e., its meaning), but rather on the implications of traditions which are key foundations of social bonding and identity.

Social Learning

Social learning theory is the premise that learning is achieved through observation and imitation (Jeanes 2019). By observing what is beneficial to another individual or the group, imitation is performed with the expectation that the act will produce similar results. Cousin (2006) suggests that over-performance or

embellishment continues as a result of threshold concept development and is increasingly difficult to remove from behaviour and foundational knowledge — even if flawed. According to Garrow and Gosden (2012, 156), the aims behind each ritual performance or sequence may not be understood by the observer or even by some of the performers. As a result, ritual performances may, over time, become more elaborate as generations of children are taught or trained because they do not initially understand the concept of the actions imitated.

Alternatively, in the case of gaps in generational deposition practice, each period of activity will have slight variations from the previous practice because they are missing direct observation. When periods of activity are examined, we can begin to see intervals of elaboration, generational gaps of practice, and a renewed uptake in performances. However, periods of activity for depositional traditions reported from Britain are mostly dependent upon typological sequences and, therefore, more reflective of the object's manufacture and circulation than the deposit period.

While Davies (2018) has suggested that episodes of little or no representation of practice could be periods of forced forgetfulness, perhaps cycles of intensive practice denote reaffirmation of societal and cultural identities. Therefore, depositional practices would have been taught through social learning, which is achieved through observation and imitation. However, there are expected nuances.

Dates of activity in Wales are sourced from thirty-two case studies, and evidence from both the object and depositional quantities show a high level of elaborative practice of wetland depositional traditions from the transitionary period of the British Early Iron Age until the early first century BC. A spike in activity occurred from around 100 BC to around 60 BC and could represent a few generations of intensive practice. After this initial spike, there is a lack of depositional activity apart from systematic single-object deposits at low quantities. The second horizon of activity occurred from about 15 BC to AD 60 until about AD 125 which coincides with the Roman Conquest.

Scotland, sourced from seventy case studies, also shows a continuous practice of wetland deposition throughout the Iron Age. Correlation of object and deposition quantities show a spike in activity from around 800 BC until about 700 BC, again reflecting the transition from the British Bronze Age into the Iron Age period. Activity remains consistent with the correlating object and deposition quantities thereafter until the second horizon of activity. The second horizon occurs from the beginning of the first century AD and lasted until AD 200. Variations in the new uptake of practice could have occurred due to the potential lack of direct observation. Likewise, because of the intensive and assumed broader collaborative engagement through object and depositional quantities, these variations make sense when considering higher mimicry levels for a practice not necessarily understood by the masses, especially regarding the generational effect.

Generational Effect

The generational effect is the ability to remember information better when processed internally as opposed to held by an outside source (McCurdy and others 2017, 202). Information is processed and retained at a higher standard when learned through memory instead of assistance from texts. Concepts and cultural practices associated with deposition were learned through observation and context-dependent memory. Depending on the degree of complexity of certain words and phrases, recall is more prevalent for lower constrained tasks when external and internal stressors are applied, according to a study by McCurdy and others (2017, 202, 215). However, the research suggests that generational learning can be improved when individuals have more access to materials to aid in recall (McCurdy 2017, 203).

Recall material can be represented in the topography and movement through a landscape, such as moving from a place of habitation to a location for resource extraction. Tangible objects and materials are especially helpful as active mnemonics because old and new memories are easily associated (Bellezza 1996; Hamilakis 2010; Putnam 2015). Therefore, during an active state, the object present during events that create memories, like tankards at a feast, would allow for greater recall of all associative events where the object was present. In addition, the handle may become more symbolic of collective memory because of the communal handling of a certain portion of an object. As a result, the handle's mnemonic properties are more charged than the rest of the object and perhaps why so many of these pieces have been reported from depositional contexts, like those reported from Nant-y-cafn and Langstone, Wales (Davis 2014; Gwilt and Lewis 2009; Horn 2015) (Fig. 3.1).

There are also generic and specific symbols which convey communal identity. Chariot tyres and horse gear could be representative of chariot culture. However, in locations like Llyn Cerrig Bach, Wales, where tyre deposition is predominant in the assemblage's object variation (minimum number eighteen tyres, sixty pieces recorded) (Lynch 1970, 264; Roberts 2002, 36), perhaps the chariot or cart was more representative of the group than the associated equestrian gear (Fig. 3.2). Nevertheless, if we consider commodities, it is also likely that chariot tyres were chosen because their manufacture was less expensive than equestrian gear and therefore preferred for communal deposition at greater quantities. The same symbolism could be

Figure 3.1. Handles from the Nant-y-cafn hoard reported from Wales in 1875. The picture is the property of the National Museum of Wales.

Figure 3.2. One of the many tyres from the Llyn Cerrig Bach hoard reported from Wales in 1942–1945. The picture is the property of the National Museum of Wales.

present with the deposition of metal strips or sheets, which could be characteristic of deposits which denote exchange or metalworking trades.

Overall, studies performed by Godfrey and Richardson (2004) and Jones and Russell (2012) have shown that the loss of oral tradition has been linked with diminished social memory and identity. Therefore, it makes sense that objects were used to further fortify recall of wetland locations. However, the retention of objects alone is not the only mnemonic device available, topography and the act of deposition played a significant role in the longevity of collective memory.

Method of loci

The method of *loci* works as a mnemonic through the association of visual organization to assist in recall with the aid of developed mental imagery (McCabe 2015). This method works by visualizing oneself in the desired environment. Remembering locations becomes easier by familiarizing ourselves, but also by relating objects with the desired location. Therefore, in a deposition setting, the object, now donated, would become associated with the location and memory of that event. Voluntarily or involuntarily, memories would be invoked whenever in that specified topography or upon seeing and handling a similar object.

This recall method works both top to bottom and bottom to top (i.e., landscape to object or object to landscape). As a result, we can begin to expect that certain objects would have become associated with specific environments through wetland deposition practices. If the method of *loci* were taught or observed and, therefore generationally mimicked, we would expect to see a stronger association for certain object types with specific wetland landscapes. Fontijn (2007, 77) views deposition itself as a form of recall using accounts of cultural transmission based on examples drawn from Melanesian ethnography. According to Fontijn (2007), the act of deposition acts as a central memory through the destruction or removal of an object through particular ceremonies, and thus becomes a form of 'remembrance by removal.' These observed acts were intended to leave little to no trace of their practice aside from the material deposited. While British Iron Age material sourced from wetlands have little evidence of destruction aside from key examples of Llyn Cerrig Bach or the systematic destruction of sword tips, disassembled objects were far more prevalent in practice during this period. Further evidence of the archaeological evidence through the association of object(s) and environment will be further discussed later in this chapter.

Cognitive Development in Wetland Deposition Practices

Cognitive development shows itself in wetland deposition through the topographic and object connections. Bradley (2000, 158) suggests that the performance of deposition was meant to be generationally remembered through collective memories of the event. However, complex and high-stress events tend to generate a lessened ability to recall. Therefore, these traditions would have been practised in low-stimulus, repetitious, and co-participant events.

In a study performed by Power (2018), analysing Hindu performances in India it was found that stronger support networks developed for those who participated in collective events. These bonds grew stronger when co-participants experienced collective emotional experiences — either negative or positive. Therefore, as Hobson and others (2017) theorize, collective performances practised under similar constraints and variables would produce the same level of unity. This is because collective practice creates trust and cultural assimilation through participation (Sosis 2006; Whitehouse and Lanman 2014), which results in generational memory. As a result, topography plays an important setting in these collaborative practices in which memory is created, extended, and generationally imprinted. The locations and movement throughout are a key element of recall and the sensorial memories associated with specified landscapes.

Topographic Connections

Regional trends in preference of specific wetland environments for depositional practices may reflect communal and regional traditions. However, these patterns are not without their bias due to differing collection methods and inherent taphonomic bias.

Overall, peatlands were the most common landscape in which deposition sites have been reported from the 102 case studies. However, when the different floodplain types (i.e., river, estuary, or generic) are combined, these landscapes show a higher level of activity in correlation

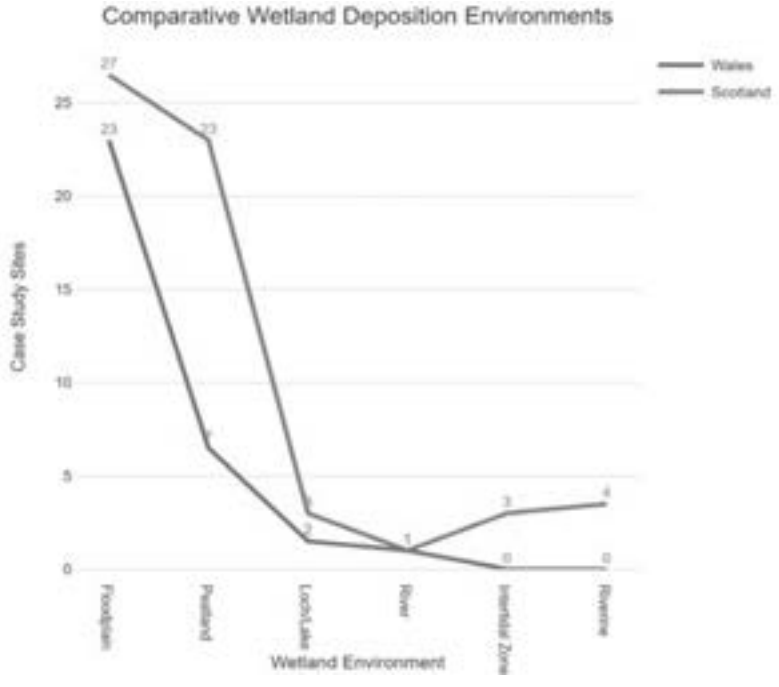


Figure 3.3. Preferred wetland depositional landscapes observed from case studies sourced from British Iron Age Wales and Scotland (Treadway 2021b).

to depositional practices (Fig. 3.3). Nevertheless, the high figures reflected in floodplain depositions may be the result of original river deposition that has since migrated and finally deposited in the periphery floodplains.

Nonetheless, we must consider why these individuals would want to access certain wetland locations in the first place. The answer is seemingly apparent when we consider the abundance of natural resources that communities could utilize. For example, river reeds commonly found along rivers and floodplains could have been used for basketry (like that found at Glastonbury Lake Village) or rope (e.g., Coles and Coles 1994–1995). Likewise, the fauna and flora available in these locations would have also provided dietary resources.

Sediment Connections

Correlating wet sediment of deposition sites was examined to see if there was any possible relationship with the wetlands in which objects were reported. As stated previously, this analysis has a degree of bias because of minor to major fluctuations of certain wetland environments through natural river migrations and successive ecology to human alterations such as deforestation, agriculture, drainage, and urbanization.

A review of the associated sediment types in correlation to the wetland find-spots reported showed that deposition in peat and peat compounds is the most common context (Fig. 3.4). Wet acid loam and clay are the second most common sediment context for Wales, whereas gley soils are more prevalent for Scotland, having nineteen accounts.

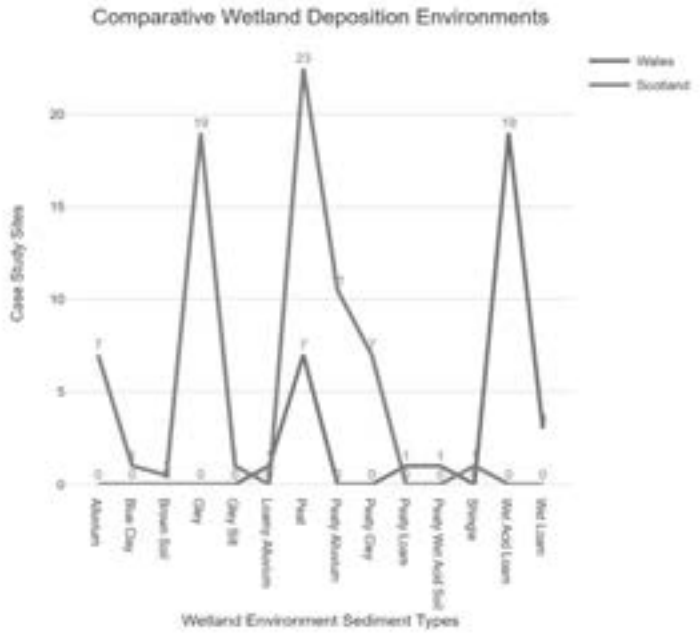


Figure 3.4. Associated sediment types observed from preferred wetland locations for deposition (Treadway 2021a).

Perhaps what was an important indicator of the appropriate environment for deposition was not only the wetland landscape but the sediment. The preservative qualities of peat were well known to prehistoric peoples (e.g., bog bodies and butter). Therefore, in areas where peat was not accessible, other wet sediments and (or) wetland landscapes with anaerobic qualities were sourced for deposition.

The Objects and Assemblages

Treadway (2021a) categorized British Iron Age wetland deposition traditions as multiperiod and single-period hoards, pairs (isolated to Scotland), multiperiod and single-object deposits. The quantity and quality of assemblages are perhaps indicative of social hierarchy and communal involvement (Davis 2014). However, contributing to a common practice would further fortify social relations through a shared experience and reaffirm associated cultural identities.

The method of *loci* theory suggests better recall when more materials are in association with specified activities, or familiarization with an environment. Deposition in wetlands serves to fulfil both these functions of recall by associating both objects and topography. This correlation is evident when object types are compared with associated wetland landscapes for Iron Age Wales and Scotland (Fig. 3.5). For example, specified associations are reflected with tools, sourced only from peatlands and lakes. Alternatively, there are common associations with multiple landscape types, as seen with equestrian gear. Therefore, equestrian gear may have been a more commonly produced item type and was also appropriate for deposition in several different wetland locations; what is likely is that there was more of this object type in circulation.

Generational associations of objects and their corresponding depositional locations would have been taught through social learning. Both observation and longevity of certain oral traditions would have fortified unspoken rules of object allocation and their appropriate setting for final placement. These objects would have had an assumed mnemonic property through their living context and final act of deposition.

Discussion

The development and evolution in the complexity of wetland deposition traditions have affected how objects were conceptualized, handled, and connected with chosen wet landscapes. Likewise, the chosen assemblage for deposition reflects the social identity and preferred method of depositional practice of the

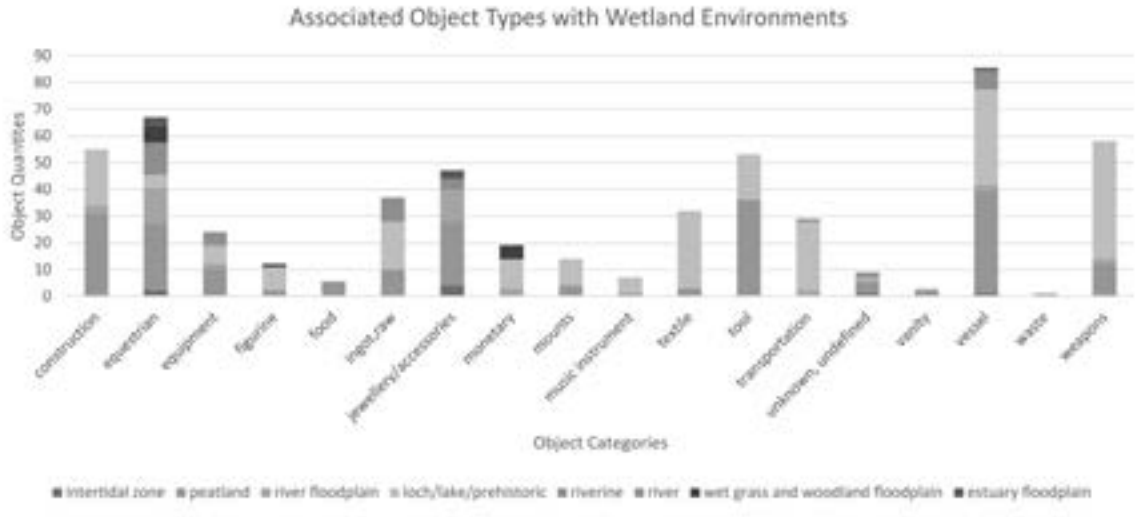


Figure 3.5. Associated object types by quantity in comparison with the different wetland landscapes in which they were reported (Treadway 2021a).

donating group(s). The selected wetland landscape and associated topography also created a sensorial experience that would have fortified generational practice through cognitive memory development.

Therefore, deposition practice has strong ties to cognitive recall from the object's initial creation, its use and handling within its living context and purpose, to its initial removal through associated performances (e.g., the object selection, possible dismantling, and carrying it through the topography). Objects are therefore transformed from an active and tangible mnemonic to the abstract through its deposition. For those who participate, a common physical and emotional event is shared to establish additional social bonding and assimilation into society through active participation, thereby creating a momentous collective memory.

Conclusion

In conclusion, cognitive development theory, with the assistance of mnemonics, can help archaeologists begin to deconstruct wetland deposition practice and the resulting development of social and communal identity. Prolonged periods of wetland deposition create increased elaborate practice. This elaboration can be represented through both the number of deposit sites to the quantity donated. However, each variation and the typologies represented is reflective of the community and their identity. As a result, wetland deposition traditions were not exclusive to traditionalist or functionalist purposes but were intertwined, whereby collective memory served to benefit both the group and the individual.

Works Cited

Bellezza, Francis S. 1996. 'Mnemonic Methods to Enhance Storage and Retrieval', in *Memory*, ed. by Elizabeth Ligon Bjork and Robert A. Bjork, Handbook of Perception and Cognition, 2nd edn (Cambridge: Academic Press), pp. 345–80

Bradley, Richard. 1989. *Monuments and Places*, Sacred and Profane, 32 (Oxford: Oxford University Committee for Archaeology)

——. 1990. *The Passage of Arms: An Archaeological Analysis of Prehistoric Hoards and Votive Deposits* (Cardiff: Cardiff University Press Archive)

——. 2000. *An Archaeology of Natural Places* (London: Routledge)

——. 2005. *Ritual and Domestic Life in Prehistoric Europe* (London: Routledge)

——. 2017. *A Geography of Offerings: Deposits of Valuables in the Landscapes of Ancient Europe* (Oxford: Oxbow)

Brück, Joanna. 1999. 'Ritual and Rationality: Some Problems of Interpretation in European Archaeology', *European Journal of Archaeology*, 2: 313–44

——. 2006. 'Death, Exchange and Reproduction in the British Bronze Age', *European Journal of Archaeology*, 9: 73–101

Chadwick, Adrian M. 2012. 'Routine Magic, Mundane Ritual: Towards a Unified Notion of Depositional Practice', *Oxford Journal of Archaeology*, 31.3: 283–315

Coles, Bryony, and John M. Coles. 1994–1995. *Enlarging the Past: The Contribution of Wetland Archaeology; The Rhind Lectures for 1994–5* (Edinburgh: Society of Antiquaries of Scotland)

Cousin, Glynis. 2006. *An Introduction to Threshold Concepts* (London: Routledge)

Cunliffe, Barry. 2004. *Iron Age Communities in Britain: An Account of England, Scotland and Wales from the Seventh Century* BC *until the Roman Conquest* (London: Routledge)

Dark, Petra. 2006. 'Climate Deterioration and Land-use Change in the First Millennium BC: Perspectives from the British Palynological Record', *Journal of Archaeological Science*, 33.10: 1381–95

Davies, Alex. 2018. 'Objects, Place and People: Community Organisation in Southern Britain in the First Millennium BC', *Cambridge Archaeological Journal*, 28.2: 321–44

Davis, Mary. 2014. 'Technology at the Transition: Relationships between Culture, Style and Function in the Late Iron Age Determined through the Analysis of Artefacts' (unpublished doctoral thesis, Cardiff University)

Fontijn, David R. 2007. 'The Significance of "Invisible" Places', *World Archaeology*, 39: 70–83

——. 2008. 'Everything in its Right Place? On Selective Deposition, Landscape and the Construction of Identity in Later Prehistory', in *Prehistoric Europe: Theory and Practice*, ed. by Andrew Jones (Hoboken: Wiley-Blackwell), pp. 86–106

Garrow, Duncan, and Chris Gosden. 2012. *Technologies of Enchantment? Exploring Celtic Art; 400* BC *to* AD *100* (Oxford: Oxford University Press)

Godfrey, Barry S., and Jane C. Richardson. 2004. 'Loss, Collective Memory and Transcripted Oral Histories', *International Journal of Social Research Methodology*, 7: 143–55

Giles, Melanie. 2007. 'Making Metal and Forging Relations: Ironworking in the British Iron Age', *Oxford Journal of Archaeology*, 26.4: 395–413

Gwilt, Adam, and Mark Lewis. 2009. 'Langstone, Newport: Two Bronze Bowls, a Wine Strainer and a Tankard', in *Portable Antiquities and Treasure Act Annual Report 2007* (London: British Museum), pp. 68–69

Hamilakis, Yannis. 2010. 'Re-collecting the Fragments: Archaeology as Mnemonic Practice', in *Material Mnemonics: Everyday Memory in Prehistoric Europe*, ed. by Katina T. Lillios and Vasileios Tsamis (Oxford: Oxbow), pp. 188–99

Hill, J. D. 1996. 'Hillforts and the Iron Age of Wessex', in *The Iron Age in Britain and Ireland: Recent Trends*, ed. by Timothy C. Champion and John Collis (Sheffield: Collis), pp. 95–116

Hingley, Richard. 2006. 'The Deposition of Iron Objects in Britain during the Later Prehistoric and Roman Periods: Contextual Analysis and the Significance of Iron', *Britannia*, 37: 213–57

Hobson, Nicholas M., Francesca Gino, Michael I. Norton, and Michael Inzlicht. 2017. 'When Novel Rituals Lead to Intergroup Bias: Evidence from Economic Games and Neurophysiology', *Psychological Science*, 28: 733–50

Hodder, Ian. 1982. 'Theoretical Archaeology – A Reactionary View', in *Symbolic and Structural Archaeology*, ed. by Ian Hodder (Cambridge: Cambridge University Press), pp. 1–17

——. 1986. *Reading the Past* (Cambridge: Cambridge University Press)

Horn, Jonathan A. 2015. 'Tankards of the British Iron Age', *Proceedings of the Prehistoric Society*, 81: 311–41

Jeanes, Emma. 2019. 'Social Learning Theory', in *A Dictionary of Organisational Behaviour*, ed. by Emma Jeanes (Oxford: Oxford University Press), <https://www.oxfordreference.com/view/10.1093/acref/9780191843273.001.0001/acref-9780191843273-e-273?rskey=ucvCl7&result=274> [accessed 4 September 2024]

Johns, Catherine. 1996. 'The Classification and Interpretation of Romano-British Treasures', *Britannia*, 27: 1–16

Jones, Siân, and Lynette Russell. 2012. 'Archaeology, Memory and Oral tradition: An Introduction', *International Journal of Historical Archaeology*, 16: 267–83

Knight, Matthew G., Dot Boughton, and Rachel E. Wilkinson. 2019. *Objects of the Past in the Past: Investigating the Significance of Earlier Artefacts in Later Contexts* (Oxford: Archaeopress)

Liberman, Zoe, Katherine D. Kinzler, and Amanda L. Woodward. 2018. 'The Early Social Significance of Shared Ritual Actions', *Cognition*, 171: 42–51

Lynch, Frances. 1970. *Prehistoric Anglesey: The Archaeological Study of the Island to the Roman Conquest* (Llangefni: Anglesey Antiquarian Society)

McCabe, Jennifer A. 2015. 'Location, Location, Location! Demonstrating the Mnemonic Benefit of the Method of Loci', *Teaching of Psychology*, 42.2: 169–73

McCurdy, Matthew P., Ryan C. Leach, and Eric D. Leshikar. 2017. 'The Generation Effect Revisited: Fewer Generation Constraints Enhances Item and Context Memory', *Journal of Memory and Language*, 92: 202–16

Piaget, Jean. 1972. 'Intellectual Evolution from Adolescence to Adulthood', *Human Development*, 15.1: 1–12

——. 1990. *The Child's Conception of the World* (New York: Littlefield Adams)

Power, Eleanor A. 2018. 'Collective Ritual and Social Support Networks in Rural South India', *Proceedings of the Royal Society B: Biological Sciences*, 285: 1–7

Putnam, Adam L. 2015. 'Mnemonics in Education: Current Research and Applications', *Translational Issues in Psychological Science*, 1.2: 130–39

Renfrew, Colin. 2009. 'Towards a Cognitive Archaeology', in *The Ancient Mind: Elements of Cognitive Archaeology*, ed. by Colin Renfrew and B. Zubrow (Cambridge: Cambridge University Press) <https://doi.org/10.1017/CBO9780511598388.002>

Renfrew, Colin, and Paul Bahn. 1991. *Archaeology, Theories, Methods, and Practice* (London: Thames and Hudson)

Roberts, Owain T. P. 2002. 'Accident Not Intention: Llyn Cerrig Bach, Isle of Anglesey, Wales—Site of an Iron Age Shipwreck', *International Journal of Nautical Archaeology*, 31.1: 25–38

Sosis, Richard. 2006. 'Religious Behaviours, Badges and Bans: Signalling Theory and the Evolution of Religion', in *Where God and Science Meet: How Brain and Evolutionary Studies Alter our Understanding of Religion*, ed. by Patric McNamara (Westport: Praeger), pp. 61–86

Tipping, Richard. 2002. 'Climatic Variability and "Marginal" Settlement in Upland British Landscapes: A Re-evaluation', *Landscapes*, 3.2: 10–29

Treadway, Tiffany. 2021a. 'Traditions of the Separate: Creation of Wetland Deposition Knowledge-scapes', *Knowledge-scapes: Archaeological Review from Cambridge (ARC)*, 35.2: 130–47

——. 2021b. 'Analysis of Wetland Deposition in Iron Age Wales and Scotland' (unpublished doctoral thesis, Cardiff University)

Turner, Victor Witter. 1975. 'Symbolic Studies', *Annual Review of Anthropology*, 4.1: 145–61

Wait, Gerald A. 1985. *Ritual and Religion in Iron Age Britain* (Oxford: BAR)

Whitehouse, Harvey, and Jonathan A. Lanman. 2014. 'The Ties that Bind Us: Ritual, Fusion, and Identification', *Current Anthropology*, 55: 674–95

MARTINA BLEČIĆ KAVUR

4. *There Is a Light that Never Goes Out!*

New and Old Hoards from the Northern Adriatic

▾ **ABSTRACT** The broader cultural territory of *Caput Adriae* featured in the Late Bronze Age numerous hoards structured into four chronological horizons. However, in the eastern part of the northern Adriatic, they are a relatively rare phenomenon. Until recently, we had only two hoards from Istria, but lately, these were joined by two hoards from Kvarner and Gorski Kotar, altering the perceived image of hoards on this territory.

In the broader perspective, linked to modest contexts of the distribution of northern Adriatic necropolises, to individual finds and discoveries of moulds, they provide new, trustworthy possibilities of evaluation. They are perceived as a specifically determined 'act' of defined cultural knowledge from a broader but contemporary network of meaning stretching from Padania, across the south-eastern Alps, all the way to Pannonia.

▾ **KEYWORDS** *Caput Adriae*, Istria, Kvarner, Late Bronze Age, Early Iron Age, hoards

Introduction

The eastern part of the northern Adriatic (Croatia) includes the areas of Istria, the islands and Kvarner Bay, as well as the hinterland all the way to the Notranjska and Gorski Kotar regions (Fig. 4.1). Its position, at a point where the Adriatic Sea cuts deeply into the European mainland, has always allowed the permeation of waterway and land communications, and thus the combination of Mediterranean and continental cultural influences.

A unique geographic complex and exceptional natural ecosystem — including the coast, islands, and hinterland, with shallow sea, abundant drinking water and mild Mediterranean climate created basic preconditions for the life of numerous Bronze and Iron Age communities (Blečić Kavur 2021).

Conventionally, this area was considered as being empty on maps of Late Bronze Age hoards of Europe, although in the wider area of *Caput Adriae* they were present in large numbers and chronologically structured into four horizons (Turk 1996; 2012). Until recently, the only known hoards from Istria were two smaller Late Bronze Age hoards (*Monte Maestà* and Baredine) that were thought to be lost, and two hoards (Petrapilosa and Tivoli) from the Iron Age (Mihovilić 1991). However, in Kvarner and its hinterland, they were completely absent, and the interpretation of this period was based exclusively on material culture from settlements, graves, or

Martina Blečić Kavur • University of Primorska, Faculty of Humanities, Slovenia — Koper 6000, Titov trg 5 (martina.blecic.kavur@upr.si)

Hoards from the European Bronze and Iron Ages: Current Research and New Perspectives, ed. by Marcin Maciejewski, János Gábor Tarbay, and Kamil Nowak, NAA, 4 (Turnhout, 2024), pp. 41–52.
BREPOLS PUBLISHERS DOI 10.1484/M.NAA-EB.5.142436

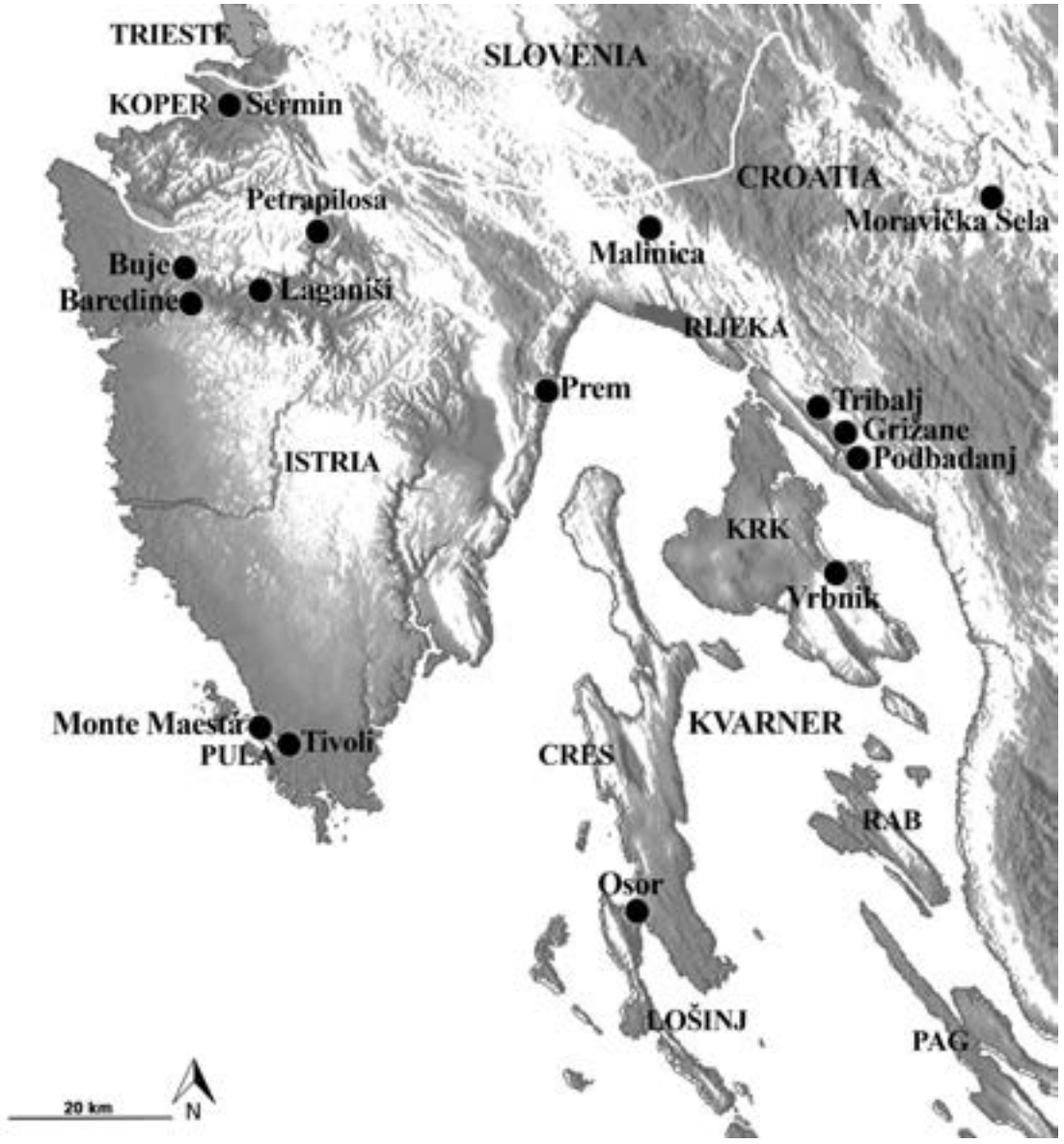


Figure 4.1. Geographical position of Istria and Kvarner with sites discussed in the text. Map by author.

individual finds, thus being distinctly reduced in form and based on a selected range of material. This was reflected in the understanding of the epoch in general, but even more so in the narratives dealing with the variability of practices forming the way of life of the local communities of that time.

This study will present the first Late Bronze Age hoards from the Kvarner and Gorski Kotar areas (Moravička Sela and Prem), considered in the context of the phenomenon of deposition in the *Caput Adriae* region. Chronologically, all hoards will be discussed with an emphasis on selected objects that indicate both interactions in the extensive cultural and geographical space, as well as social moments significant for superregional trends from the passage to the last prehistoric millennium from which that part of the 'old world' was not excluded. At the very end an Early Iron Age hoard from Malinica will be presented.

Hoards from the Older Phase of the Late Bronze Age

The first hoard comes from Maištada in Štinjan near Pula, known as *Monte Maestà*. It is a small hoard of a homogeneous composition consisting of four axes with central wings included in the Ia phase of the Histrian culture group (Mihovilić 1991, 207–08, fig. 3; 2013, 118, fig. 66) (Figs 4.1; 4.2: 1–3). Typologically and stylistically, they belong to the group of axes characteristic of the Peschiera horizon of northern Italy, where they

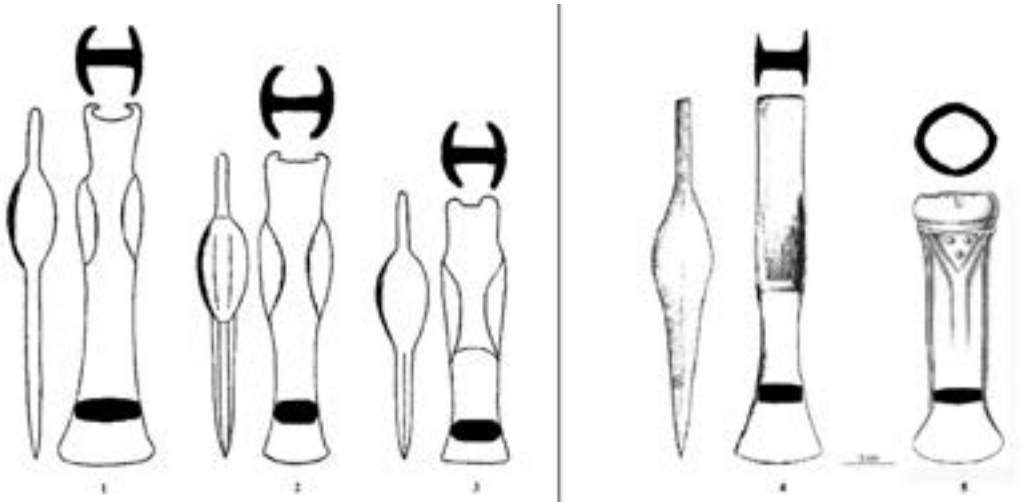


Figure 4.2. 1–3: Late Bronze Age hoard from Monte Maestá (after Mihovilić 1991); 4: winged axe from Tribalj; 5: socket axe from Osor (after Blečić Kavur 2014). Created by the author.

were most numerous (Tasca and Vicenzutto 2014). Being also present in the south-eastern Alpine area, they are comparable to a large group of Freudenberg type axes present in hoards of the central and eastern Alps characteristic of the Ba D/Ha A phases (Mayer 1977, 130–42; Šinkovec 1995, 132–34, figs 2, 3). The *Monte Maestà* hoard, due to its composition and size, preservation, and typological features of the axes, must be included in the I horizon of the hoards in the *Caput Adriae* region (Turk 1996, 106–07) and thus treated as the oldest Late Bronze Age hoard in the discussed area.

Individual finds of winged axes are also known from Kvarner. Worth mentioning is the example from Tribalj near Crikvenica belonging to the less numerous axes of Guntramsdorf type (Žeravica 1993, 68, pl. 18, 226; Blečić Kavur 2014, 94, pl. 2, 173), which allegedly originated from an axe hoard (Figs 4.1; 4.2: 4). A fragment of the upper body of an axe with highly raised wings is also known from Vrbnik on the island of Krk, belonging to a large superregional and very frequent group of Haidach type axes (Blečić Kavur 2014, 93–94, fig. 54, 17) (Fig. 4.1). The only winged axe that originates from recent research and has a known archaeological context comes from the Laganiši cave near Oprtalj in Istria (Fig. 4.1). According to its characteristics, it is also assigned to the Central European Freudenberg type (Mihovilić 2008, 45).

Furthermore, a socketed axe without a loop, with a thickened edge, and a 'Y' ornament, comes from Kvarner, from Osor on the island of Cres (cf. Žeravica 1993, pl. 36, 489) (Figs 4.1; 4.2: 5). Despite the fact that it lacks a known archaeological context, it is the first, and so far, the oldest such object in the northern Adriatic. Most parallels can be observed in hoards of the horizon II of the south-eastern Alpine area, where they were singled out as a south-eastern Alpine feature in the period of strong domination of the Pannonian-Carpathian metallurgical circle. The Osor example is attributed to the more numerous second variant (Budinšćina) and perceived in networks of numerous interactions with areas of the Alpine hinterland (Blečić Kavur 2014, 94–95, fig. 41, 98).

However, in the period of the thirteenth/twelfth century BC, in the Ha A1 phase, the situation in most of Europe was changing dynamically, and new shapes and types of object made their appearance.

Connections and transmissions were redirected and widening, and thus new, i.e., different ways of disposure and dedication of objects appeared. The hoard from Moravička Sela near Brod Moravice (Gorski kotar), in the hinterland of Kvarner, is a medium-sized hoard of mixed composition and is representative of that new age (Figs 4.1; 4.3). All items were typologically completely new in the region and, moreover, intentionally destroyed and fragmented. These are sickles, a flange-hilted sword of the Budinšćina/Krško type, and a miniature double pick of the Carpathian type (type E) (Blečić Kavur and others 2020). Although a regional production for the flange-hilted swords was assumed, their spatial distribution indicates a greater presence on the broader territory of southern Pannonia — from Slavonia to the Dolenjska region in Slovenia with individual finds in the river valleys of the Mura and Danube. With the presented sword, their distribution also stretches south from the Sava corridor into the Kupa Basin. In sharp contrast to the regional distribution of flange-hilted swords of Budinšćina/Krško type is the wide distribution of double picks. The miniature double pick from Moravička Sela remains, for now, the most southerly find and could be understood as a specific subject of inter/transregional contacts and transmissions between individuals and societies (Blečić Kavur and others 2020, 415–18, figs 5–7) (Fig. 4.4).

Figure 4.3. Late Bronze Age hoard from Moravička Sela. Photo by author.

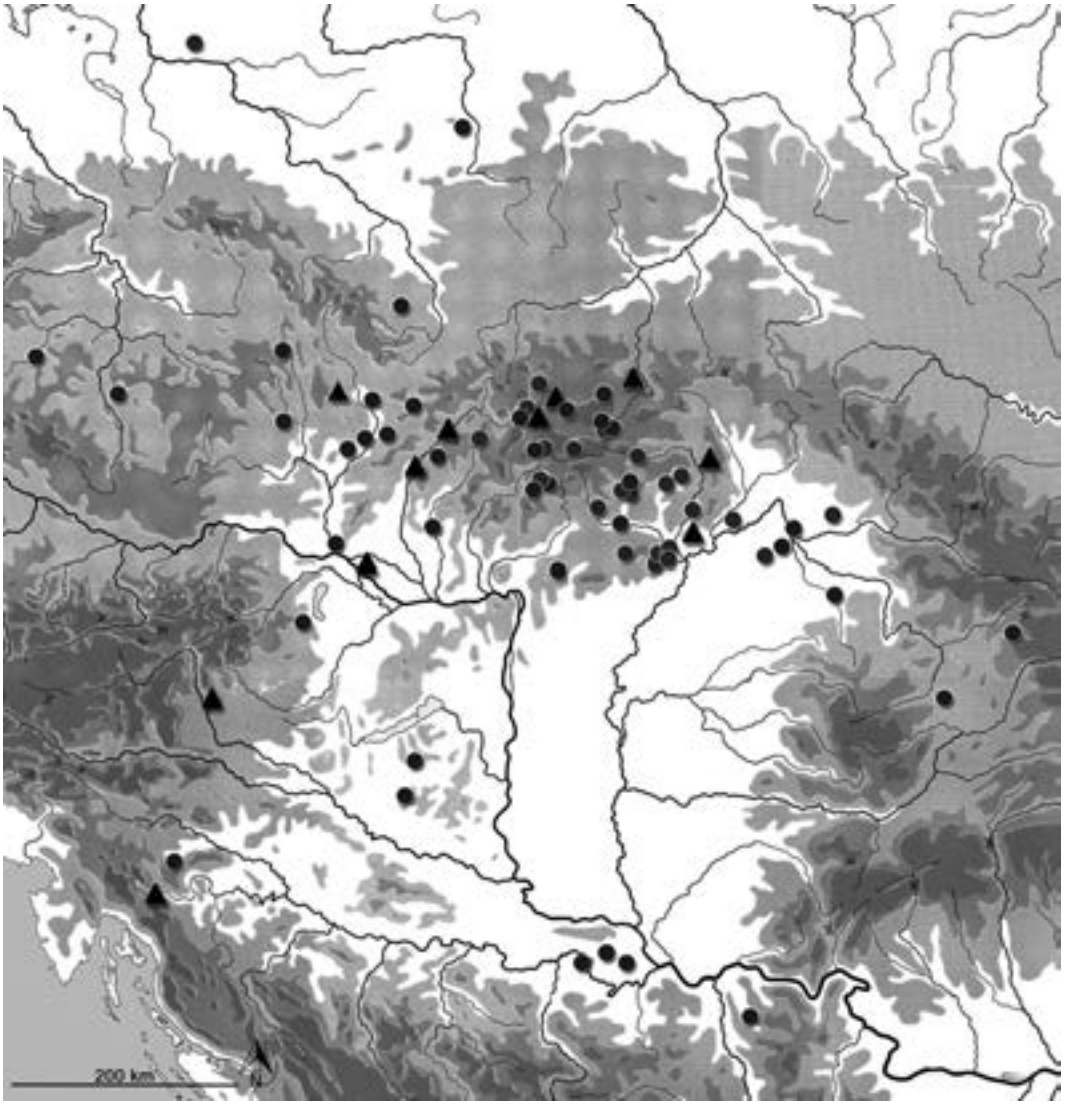


Figure 4.4. Distribution of double picks of Carpathian types (●) and miniature double picks (▲) (after Blečić Kavur and others 2020). Map by author.

The hoard from Moravička Sela is, according to the original context of discovery, stylistic analysis, and typological classification of discovered artefacts as well as their spatial distribution, related to the horizon II of hoards in the broader territory of *Caput Adriae* and its hinterland (Turk 1996, 108–12, fig. 5). Chronologically it is thus well synchronized with the Ha A1 phase of the Central European periodization. In its form, context, and concept, the hoard represents the classical deposition pattern of mostly tools and raw materials following the principles of hoards of mixed, i.e., complex composition in the broader Pannonian, Carpathian, and eastern Alpine regions (Turk 1996, 108–12; 2012; cf. Dietrich 2014). The hoard represents a set combining local forms, which were emphatically upgraded, with selectively appropriated forms and artefacts that signalled links not only to local but also to transcultural Carpathian social elites (Blečić Kavur and others 2020, 421–26). The composition of items was deliberately collected, thoughtfully selected, and systematically deposited — different levels of preservation and modes of fragmentation make it a hoard of especially valuable items. We can observe at least two different patterns in ritual manipulation with deposited things — deliberate and violent breaking (sickles, jewellery) as well as mutilation and damage (sword, pick). All these processes, recognized in the observation of the material culture discovered, demonstrate social conditions, norms, and practices within the Late Bronze Age societies. They reflect generally accepted trends of thoughtful and structured destruction of items, which were in most cases probably decisive liminal circumstances, in a ceremonial manner and for numerous reasons excluded from the circulation of metals and raw materials (Hansen 2005; Bradley 2013; Brück 2016; Radivojević and others 2018).

Hoards from the Younger Phase of the Late Bronze Age

In this period, the hoards were even scarcer and were mostly 'old' finds without detailed information on the circumstances of their discovery. The hoard from Baredine near Brtonigla in Istria (Figs 4.1; 4.5: 1–3) was initially considered the only one from this period. It is a smaller deposit with a homogeneous composition consisting of two winged and two socketed axes (Mihovilić 1991, 207–08, fig. 4). One of the latter has a decoration of pseudo-wings, belonging to the so-called younger forms and is significant for the Carpathian Basin, especially for southern Pannonia during the III hoards horizon (Turk 1996, 112–13). Winged axes differ from each other, but they are certainly associated with Italian, younger types of axe with high set wings, a convexly extended blade, and a pronounced transition from the blade to the haft.

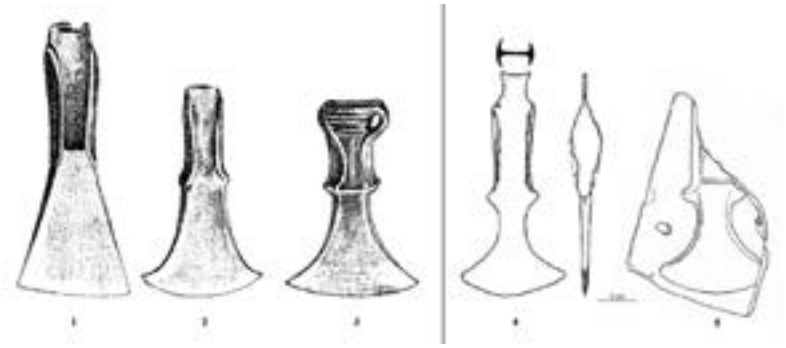


Figure 4.5. 1–3: Late Bronze Age hoard from Baredine (after Mihovilić 1991); 4: axe from Buje (after Bietti Sestieri 1998); 5: mould from Sermin (after Žbona Trkman and Bavdek 1996). Created by author.

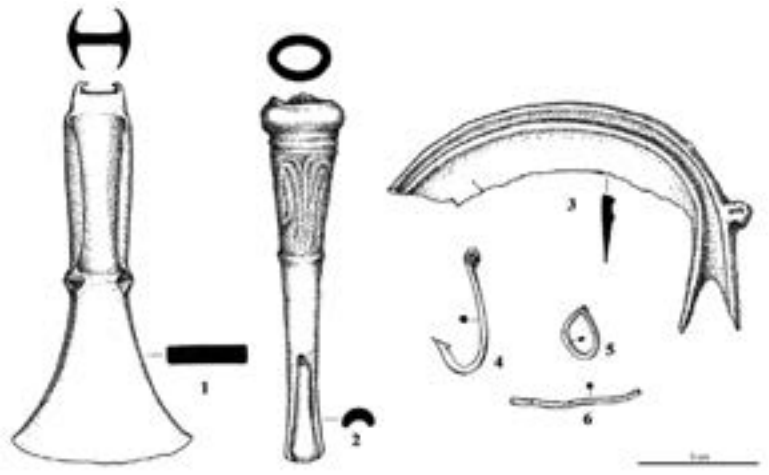


Figure 4.6. Late Bronze Age hoard from Prem. Drawing by the author.

They used to be generally included in the Ponte S. Giovanni type, but are now divided into subgroups (Leonardi and others 2015; Tasca 2017). Thus, the axe with a trapezoidal and elongated blade, like the most similar example from the Kanalski vrh hoard I, was included in the regional Teor type from Friuli (Tasca 2017). The second axe from Baredine, with a pronounced fan-shaped blade, is ascribed to the Ansciano type (Leonardi and others 2015, 413–16, figs 4–5), with the similar and geographically closest axe from the Prem hoard.

The hoard from Prem near Mošćenička Draga (Kvarner) is a smaller deposit of mixed composition from which several items, the axe and the chisel, have already been presented (Žeravica 1993, 112, pl. 43, 632) (Figs 4.1; 4.6). It features more specific, and for this area completely unusual, bronze items, such as the Hallstatt type sickle, a chisel, and a hook. All of them are almost completely preserved, which demonstrates

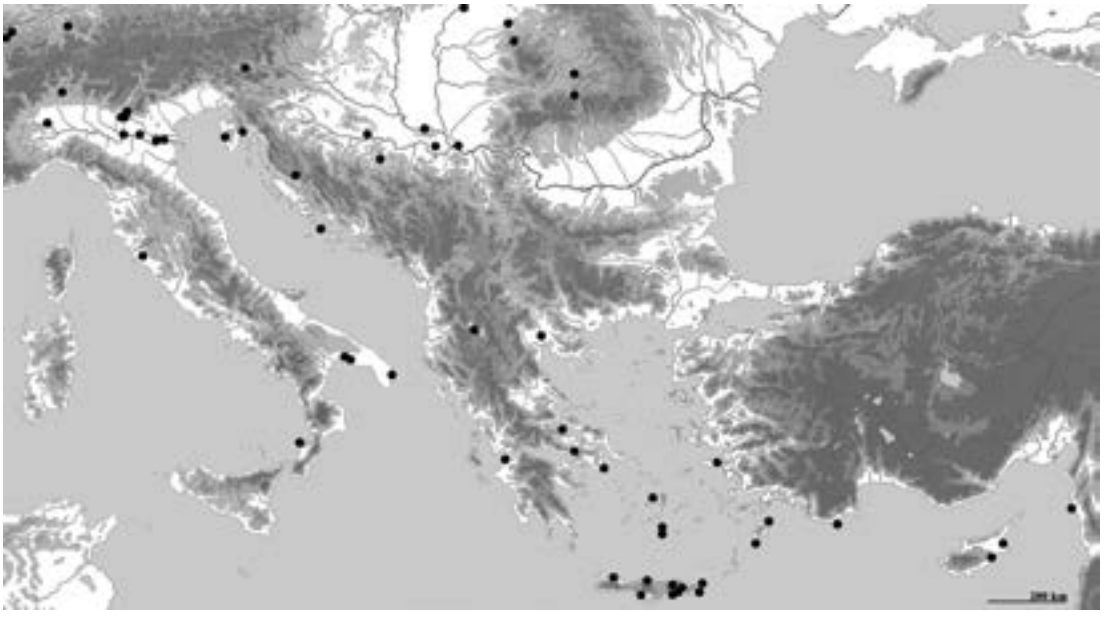


Figure 4.7. Spatial distribution of hooks in the third and second millennia BC (supplemented after Jung and others 2016). Map by author.

different manipulation of these objects during their 'life' as well as during their disposal. In composition and structure, the closest is the hoard from Galleriano near Udine (Borgna 2001, 321, fig. 14). However, its typological-stylistic and cultural-topographic attribution demonstrates the involvement of this area in cultural permeations of the wider milieu as well as regional events. As a superregional type, we can describe the Hallstatt or 2.E.1 type sickle according to Pavlin (2017, 56) (Fig. 4.6: 3), characteristic for the Pannonian-Carpathian-Balkan area, where we actually also find good parallels for the pseudo 'Y' decorated chisel, especially in the Román hoard (Schalk 2005, 101–02, figs 5, 10) (Fig. 4.6: 2). As a highly functional tool appropriate to the place and time, the hook with the eye and the barb is especially interesting (Fig. 4.6: 4). Together with two hooks from the Limska Gradina in Istria and Donja Cerovačka Cave in Lika (Tresić Pavičić 2020) it is still a rather rare find on the (northern) Adriatic. Although the evolution of bronze hooks of different variants can be followed during the third and second millennia BC across a large area of Europe, from the Swiss Alps all the way to the eastern Mediterranean, they are still rare finds in hoards (Jung and others 2016, 179–87, fig. 4) (Fig. 4.7).

Finally, we can observe the axes of the Ansciano type in a much narrower regional distribution — they are present in Istria, Fratessina, and central Italy (Leonardi and others 2015) (Figs 4.6: 1; 4.8). Their excellent preservation as well as the chemical composition with a very small percentage of tin, such as in the axe from Kanalski vrh hoard I, demonstrate a different purpose and functional uselessness (Žbona Trkman and Bavdek 1996, T. 95, 2; Trempuž-Orel and Heath 2001, 150). Although the axe from Prem was included in the classification and distribution of numerous axes of the Ponte S. Giovanni type (Bietti Sestieri 1998; Bellintani and Stefan 2008; cf. Angelini and others 2013), we can associate it today only with an individual find from Buje (Bietti Sestieri 1998, fig. 4, 7) (Figs 4.1; 4.5: 4) and most importantly, with the only known stone mould for this type of axe from Sermin near Koper (Žbona Trkman and Bavdek 1996; cf. Leonardi and others 2015) (Figs 4.1; 4.5: 5). All presented axes with a convexly spread blade are extremely well preserved, so they probably had a conceptually different purpose and were undoubtedly a technological innovation of the wider area of *Caput Adriae* with an emphasis on the eastern part of Friuli and Posočje, all the way to Istria, where they are represented by three types, and where production of one of the local variants may be located.

The hoard from Prem is, therefore, a combination of completely preserved objects, without traces of use as well as without traces of any ritualization of dedicated objects in the hoard. It is difficult to assume, at this time, whether we can identify a significant trend for the younger phase of the Late Bronze Age in general or perhaps indicate a special relationship for objects and their value associated with Istrian hoards, which do not exhibit deliberate destruction. Nevertheless, it moves away from Istrian hoards in terms of composition and structure, and with its heterogeneous and carefully selected objects, it demonstrates other and different approaches to the dedication of important objects.

Among individual finds, the sword with a cup-shaped terminal from Grižane near Crikvenica demonstrates that the links with the Danubian territory did

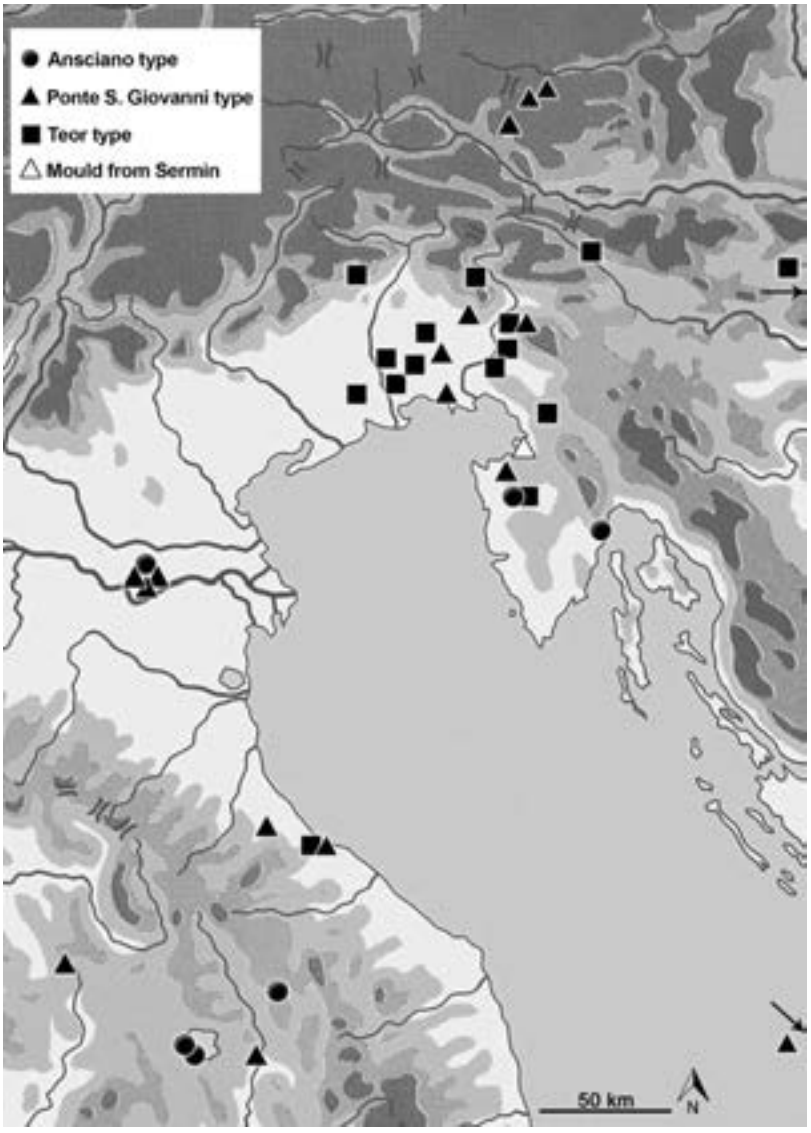


Figure 4.8. Distribution map of the winged axes of Ansciano, Ponte S. Giovanni, and Teor types and mould from Sermin (supplemented after Leonardi and others 2015). Map by author.

not cease (Fig. 4.1). On the contrary, the northern Adriatic must still be understood, both typologically and semantically, as a mediator between the Pannonian-Carpathian and Protovillanonian cultural territory of Italy. Discovered driven into the rock, it is the southernmost European find of such a type, which in terms of style still reflects a clear connection with the Carpathian area of the Ha B1 period (Blečić Kavur 2014, 97–101, fig. 57, pl.).

Further, a small laurel leaf-shaped spearhead from Podbadanj near Crikvenica could be generally associated with a large group of IIB spears in Italy, and allegedly, it also belonged to a hoard of as many as thirteen spearheads (Blečić Kavur 2014, 96, fig. 54, 119) (Fig. 4.1). Consequently, five individual finds of spearheads in the region, lacking information about their contexts of discovery, could most probably also be elements of hoards.

Instead of a Conclusion

The hoards and individual finds presented here, according to the current state of research, do not have adequate analogies in graves. This is not an unusual or exceptional situation — it follows a pattern known from the immediate south-eastern Alpine hinterland and southern Pannonia (Turk 1996, 117–21; Ložnjak Dizdar 2011). It is certain that the principle of reciprocity was respected in this region as well, so that some material was carefully selected for burial and others for ritual disposal. Stylistic and typological features place these hoards in a wider time span of more than five hundred years, encompassing the phases I and II of the cultural development of Istria and Kvarner, mainly synchronized with Ba D/A1 to Ha B of the Central European periodization and hoards from the I to III horizon (Mihovilić 2013; Blečić Kavur 2014).

Figure 4.9. Early Iron Age hoard from Malinica. Photo by author.

Currently, the polarity in this (micro)regional area is also reflected in terms of case selection, so the hoards from Moravička Sela and Prem, unlike the Istrian ones, have extremely heterogeneous characteristics, with numerous of objects recorded here for the first time. Together with individual finds, they point to different socio-cultural connections, which designate them as an 'act' of specific cultural knowledge from a broader cultural network of meaning. Hoards from *Monte Maestá*, Moravička Sela, and individual axes should be understood as relating to the tendencies of the Central European and Pannonian-Carpathian metallurgical dictate on the one hand and ideological-symbolic principles on the other. Both of them demonstrate relations and concrete influences of the Urnfield culture in the territory of the northern Adriatic (Blečić Kavur and others 2020). The deposit from *Monte Maestá* shows in objects and methods of deposition closer links to the northern Italic circle, where axe-only hoards were no exception (Borgna 2001). Besides, most of the cases from that phase are related to the so-called *male principle* and the classical disposal of tools and weapons. The later hoards from Baredine and Prem, as well as the corresponding individual finds, reflect further contacts with the wider northern Alpine and Carpathian area, but also increasingly intense associations with not only northern but also central Apennine territory and a significant degree of regionalization (Turk 1996, 114; Leonardi and others 2015, 413, fig. 5). Evaluated with new analytical methods, they have a recognizable form in the semantic interpretation of hoards of the wider *Caput Adriae* territory. They act as a confirmed meeting point for various cultural influences and mobile individuals; they demonstrate participation in local and long-distance networks of established contacts.

Compared to other European regions, where the phenomenon of hoarding is emphasized and clearly defined (Bradley 2013; Brück 2016), the northern Adriatic was mainly interpreted in the absence of such a way of removing and disposing of objects from everyday circulation, thereby degrading the characteristics of social engagement and pragmatism of these communities. Currently, the presence of four (perhaps even six) hoards and the multitude of individual finds is radically changing our picture — the rising number of hoards is an indication that their number may further increase. The exact record of their discovery is mostly missing or unreliable, thus limiting the potential to address their interpretations in terms of landscape use and dedication rites. The situation is somewhat different with individual finds since they are mostly found in natural environments and are believed to be votives (Blečić Kavur 2014).

The range of types of item also increased significantly — with as many as fourteen axes, nine sickles, two swords, a chisel, double picks, a hook and other small items, the contribution to the understanding and interpretation of military equipment, tools, and raw materials of the entire northern Adriatic Basin has been updated. Furthermore, the ongoing primary archaeometallographic analyses have shown that bronzes from the older phase contain a higher percentage of tin, while in objects from the younger phase, it is blunted by a much smaller share in the composition and with

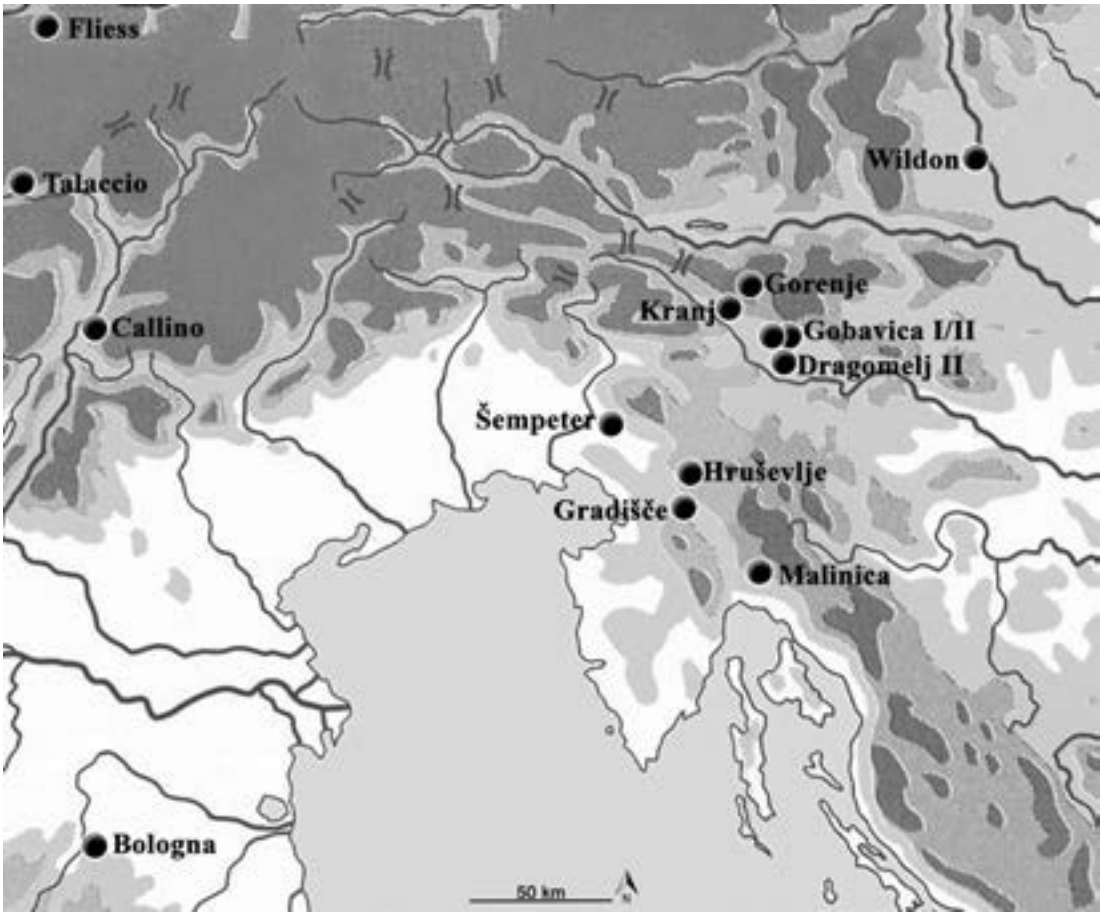


Figure 4.10. Distribution of the Iron Age hoards of the Bologna, San Francesco-Šempeter type (supplemented after Turk 2018). Map by author.

more other trace minerals. However, these objects are not only a reflection of technological and cultural standards of the Late Bronze Age but also an excellent testing ground for interpretations of their symbolic and ideological value within the communities that used, and in special ways, consecrated and disposed of them with different rites.

Moreover, the disposal of objects, as we know, does not end with the Late Bronze Age. It continues, albeit to a much reduced extent, and with different practices in the Early Iron Age.

So far, we know of only two hoards of mixed composition from Istria (from Petrapilosa near Buzet and Tivoli near Pula) that include mostly iron objects — axes and fragments of weapons (Mihovilić 1991, 208–12, pls 1–4) (Fig. 4.1). They were joined in 2018 by the discovery of a hoard in Malinica near Klana, in the immediate hinterland of Rijeka (Fig. 4.1; 4.9). Mostly copper and, to a lesser extent, bronze and iron objects were collected. Only a single axe was preserved almost undamaged, while the rest of the items were intentionally broken or destroyed — all the ingots, technical waste, used and unused axes. Out of 810 fragments, with a total weight of some 20 kg, only about two hundred items could be typologically determined — a considerable number of them being fragments of plano-convex and bar-shaped ingots (Blečić Kavur 2021, 545, fig. 7).

The hoard of mixed composition is typologically marked by mostly collared axes — as many as 103 fragments of them, significantly fewer fragments of socketed axes, and only a single fragment of a winged axe. A few pieces of ring jewellery were preserved — they represent a significant find in such large hoards (Fig. 4.9). According to a preliminary analysis, the hoard was deposited in the seventh century BC, although the items show a wide chronological range starting from the ninth/eighth century BC — just like in all related Iron Age hoards of the Bologna, San Francesco-Šempeter type (Turk 2018, 398–400, fig. 3). Hoards with a similar composition and status of objects, interpreted mostly as votive deposits, are found in the area of northern Italy, i.e., Bologna, and western Slovenia (Fig. 4.10). It is assumed with a great deal of certainty that long-used items, especially axe fragments with precisely defined weights, may have served as a means of payment in pre-monetary trade (Turk 2018). In any case, the hoard from Malinica is the first hoard of this type in the north-eastern Adriatic and the largest Iron Age hoard from Croatia (Blečić Kavur 2021).

Perceived as a representative sample for the eastern *Caput Adriae,* the hoards and individual finds presented here set new standards and provide insights into competitive metal consumption, international exchange networks, and exceptional social mediations, especially with areas rich in metals — from the Apennine Peninsula and Alps, all the way to Central and Eastern Europe. We must therefore understand them *as a light that never goes out* in terms of contributing to the archaeology of the Bronze and Iron Ages.

Works Cited

Angelini, Anna, Giovanni Tasca, and David Vicenzutto. 2013. 'Nuova ascia di bronzo finale da Cesiomaggiore (BL)', *Preistoria Alpina*, 47: 183–91

Bellintani, Paolo, and Livia Stefan. 2008. 'Sulla tipologia delle palette con immanicatura a cannone dell'età del Bronzo finale', *Rivista di scienze preistoriche*, 58: 301–20

Bietti Sestieri, Anna Maria. 1998. 'L'Italia in Europa nella prima età del Ferro', *Archeologia classica*, 50: 1–67

Blečić Kavur, Martina. 2014. *At the Crossroads of Worlds at the Turn of the Millennium: The Late Bronze Age in the Kvarner Region*, Katalozi i monografije, 11 (Zagreb: Arheološki muzej u Zagrebu)

——. 2021. 'Kvarner u starijem željeznom dobu sjevernog Jadrana / Kvarner in the Early Iron Age of the Northern Adriatic', *Arheološki vestnik*, 72: 533–50

Blečić Kavur, Martina, Boris Kavur, and Ranko Starac. 2020. 'Reflection of Action: The Late Bronze Age Hoard from Moravička Sela', *Archeologické rozhledy*, 72: 410–26

Borgna, Elisabetta. 2001. 'I ripostigli del Friuli: proposta di seriazione cronologica e di interpretazione funzionale', *Rivista di scienze preistoriche*, 51: 289–335

Bradley, Richard. 2013. 'Hoards and the Deposition of Metalwork', in *Handbook of the European Bronze Age*, ed. by Harry Fokkens and Anthony Harding (Oxford: Oxford University Press), pp. 121–39

Brück, Joanna. 2016. 'Hoards, Fragmentation and Exchange in the European Bronze Age', in *Raum, Gabe und Erinnerung: Weihgaben und Heiligtümer in prähistorischen und antiken Gesellschaften*, ed. by Svend Hansen, Daniel Neumann, and Tilmann Vachta, Topoi — Berlin Studies of the Ancient World, 38 (Berlin: Topoi), pp. 75–92

Dietrich, Oliver. 2014. 'Learning from "Scrap" about Late Bronze Age Hoarding Practices. A Biographical Approach to Individual Acts of Dedication in Large Metal Hoards', *European Journal of Archaeology*, 17: 468–86

Hansen, Svend. 2005. 'Über bronzezeitliche Horte in Ungarn – Horte als soziale Praxis', in *Interpretationsraum Bronzezeit: Bernhard Hänsel von seinen Schülern gewidmet*, ed. by Barbara Horejs, Reinhard Jung, Elke Kaiser, and Biba Teržan, Universitätsforschungen zur prähistorischen Archäologie, 121 (Bonn: Habelt), pp. 211–30

Jung, Reinhard, Marco Pacciarelli, Gerhard Forstenpointner, Gabriele Slepecki, Gerald E. Weissengruber, and Alfred Galik. 2016. 'Funde aus dem Müllhaufen der Geschichte im Befestigungsgraben von Punta di Zambrone – Angeln am spätbronzezeitlichen Mittelmeer', in *Von Baden bis Troia: Ressourcennutzung, Metallurgie und Wissenstransfer, eine Jubiläumsschrift für Ernst Pernicka*, ed. by Martin Bartelheim, Barbara Horejs, and Raiko Krauß, Oriental and European Archaeology, 3 (Rahden: Leidorf), pp. 175–206

Leonardi, Giovanni, Giovanni Tasca, and David Vicenzutto. 2015. 'Pani a piccone, palette a cannone e asce tipo Ponte S. Giovanni', in *Preistoria e protostoria del Veneto*, ed. by Giovanni Leonardi and Vincenzo Tiné, Studi di preistoria e protostoria, 2 (Firenze: Istituto italiano di preistoria), pp. 409–18

Ložnjak Dizdar, Daria. 2011. 'Starija faza kulture polja sa žarama u sjevernoj Hrvatskoj – novi izazovi', in *Starija faza kulture polja sa žarama u sjevernoj Hrvatskoj – novi izazovi*, ed. by Marko Dizdar, Daria Ložnjak Dizdar, and Sanjin Mihelić (Osijek: Arheološki muzeji), pp. 12–35

Mayer, Eugen Friedrich. 1977. *Die Äxte und Beile in Österreich*, Prähistorische Bronzefunde, 9.9 (Munich: Beck)

Mihovilić, Kristina. 1991. 'Nalazi prahistorijskih ostava na području Istre', *Arheološki vestnik*, 42: 207–18

——. 2008. 'Nekropola u jami Laganiši', in *Pećina Laganiši, mjesto života i smrti*, ed. by Darko Komšo (Pula: Arheološki muzej Istre), pp. 45–55

——. 2012. 'Bronzo finale in Istria', in *Le origini degli Etruschi: storia archeologia antropologia*, ed. by Vincenzo Bellelli (Rome: L'Erma di Bretschneider), pp. 411–31

——. 2013. *The Histri in Istria: The Iron Age in Istria*, Monografije i katalozi, 23 (Pula: Arheološki muzej Istre)

Pavlin, Primož. 2017. 'A Late Bronze Age Hoard from Gradišče near Zbelovska gora, Northeastern Slovenia', in *The Late Urnifield Culture between the Eastern Alps and the Danube*, ed. by Daria Ložnjak Dizdar and Marko Dizdar, Zbornik Insitutat za arheologiju, 9 (Zagreb: Institut za arheologiju), pp. 41–66

Radivojević, Miljana, Benjamin W. Roberts, Ernst Pernicka, Zofia Stos-Gale, Marcos Martinon-Torres, Thilo Rehren, Peter Bray, Dirk Brandherm, Johan Ling, Jianjun Mei, Helle Vandkilde, Kristian Kristiansen, Stephen J. Shennan, and Cyprian Broodbank. 2018. 'The Provenance, Use, and Circulation of Metals in the European Bronze Age: The State of Debate', *Journal of Archaeological Research*, 27: 131–85

Schalk, Emily. 2005. 'Ein Tüllenmeißel aus Olynth/Agios Mamas', in *Interpretationsraum Bronzezeit: Bernhard Hänsel von seinen Schülern gewidmet*, ed. by Barbara Horejs, Reinhard Jung, Elke Kaiser, and Biba Teržan, Universitätsforschungen zur prähistorischen Archäologie, 121 (Bonn: Habelt), pp. 95–107

Šinkovec, Irena. 1995. 'Catalogue of Individual Metal Finds from the Eneolithic and Bronze Ages', in *Hoards and Individual Metal Finds from the Eneolithic and Bronze Ages in Slovenia*, I, ed. by Biba Teržan, Katalogi in monografije, 29 (Ljubljana: Narodni muzej Slovenije), pp. 29–127

Tasca, Giovanni. 2017. 'Le asce tipo Teor nel Bronzo finale del Caput Adriae', in *Beyond Limits: Studi in onore di Giovanni Leonardi*, ed. by Michele Cupitò, Massimo Vidale, and Anna Angelini, Antenor Quaderni, 39 (Padua: Padova University Press), pp. 481–88

Tasca, Giovanni, and David Vicenzutto. 2014. 'Per una crono-tipologia delle asce dell'età del bronzo dal territorio friulano, in Preistoria e Protostoria del Caput Adriae', *XLIX Riunione scientifica dell'Istituto italiano di preistoria e protostoria (Udine, 9–12 ottobre 2014)*, <http://www.iipp.it/?p=6748> [accessed 4 September 2024]

Trempuž-Orel, Neva, and David Heath. 2001. 'Depo Kanalski Vrh – študija o metalurškem znanju in kovinah na začetku l. tisočletja pr. n. š', *Arheološki vestnik*, 52: 143–71

Tresić Pavičić, Dinko. 2020. 'Arheološko istraživanje Donje Cerovačke (Turkaljeve) špilje', *Subterranea Croatica*, 18.2: 60–74

Turk, Peter. 1996. 'The Dating of Late Bronze Age Hoards', in *Hoards and Individual Metal Finds from the Eneolithic and Bronze Ages in Slovenia*, II, ed. by Biba Teržan, Katalogi in monografije, 30 (Ljubljana: Narodni muzej Slovenije), pp. 89–124

——. 2012. 'Die Horte der Bronzezeit und ihre Fundplätze im "Kreuzungsbereich der Welten"', in *Hort und Raum: Aktuelle Forschungen zu bronzezeitlichen Deponierungen in Mitteleuropa*, ed. by Svend Hansen, Daniel Neumann, and Tilmann Vachta, Topoi — Berlin Studies of the Ancient World, 10 (Berlin: De Gruyter), pp. 211–26

——. 2018. 'Early Iron Age Hoards from Central and Western Slovenia', in *Preistoria e protostoria del Caput Adriae*, ed. by Elisabetta Borgna, Paola Càssola Guida, and Suzi Corazza, Studi di preistoria e protostoria, 5 (Florence: Istituto italiano di preistoria), pp. 397–406

Žbona Trkman, Beatriče, and Alma Bavdek. 1996. 'The Hoards from Kanalski Vrh', in *Hoards and Individual Metal Finds from the Eneolithic and Bronze Ages in Slovenia*, II, ed. by Biba Teržan, Katalogi in monografije, 30 (Ljubljana: Narodni muzej Slovenije), pp. 31–67

Žeravica, Zdenko. 1993. *Äxte und Beile aus Dalmatien und anderen Teilen Kroatiens, Montenegro, Bosnien und Herzegowina*, Prähistorische Bronzefunde, 9.18 (Stuttgart: Steiner)

ONDŘEJ CHVOJKA, JAN JOHN, JIŘÍ KMOŠEK, AND TEREZA ŠÁLKOVÁ

5. The Urnfield-Period Metal Hoards in South Bohemia

Find Circumstances, Topography, and Analyses

▾ **ABSTRACT** Today, there are sixty-three metal hoards of the Urnfield Period known in the region of south Bohemia (Czech Republic). Most of them (forty) have been discovered in the last fifteen years, but they do not often have well-documented find contexts. Nevertheless, these newly discovered hoards bring us new information about the artefacts used at that time, namely about metallurgy, trade routes and foreign contacts, rituals, as well as connections between hoards, settlements, and other types of sites. This paper presents the methods and results of interdisciplinary approaches to the study of some south Bohemian metal hoards of the Late and Final Bronze Age (Br D–Ha B). Such interdisciplinary research can provide us with some answers leading to possible interpretations of the hoards.

▾ **KEYWORDS** metal hoards, Urnfield Period, south Bohemia, topography, chemical analyses, archaeobotany

Introduction

South Bohemia is a region situated in the centre of Central Europe, between the important territories of central Bohemia, Moravia, and the Danube areas in today's Bavaria and Austria. This geographical position has made it an important point of contact where influences from different Central European areas have mixed. From the beginning of the Bronze Age onwards, the south Bohemian region played a crucial role in long-distance distribution networks, bringing, for example, Alpine copper and salt into the central parts of Bohemia, just as amber and Baltic flint were transported southwards through it (Chvojka and others 2017). The Bronze Age represents one of the peaks of the prehistoric settlement of southern Bohemia.

Hoards of metal artefacts are among the most numerous archaeological finds of the Bronze Age in this region.

Ondřej Chvojka • Institute of Archaeology, Faculty of Arts, University of South Bohemia in České Budějovice (ochvojka@ff.jcu.cz) ORCID 0000-0002-6324-4593
Jan John • Institute of Archaeology, Faculty of Arts, University of South Bohemia in České (jjohn@ff.jcu.cz) ORCID 0000-0001-9292-5630
Jiří Kmošek • Institute of Science and Technology in Art, Academy of Fine Arts Vienna / Nuclear Physics Institute of the CAS, Řež (kmosekj@gmail.com) ORCID 0000-0003-4950-5133
Tereza Šálková • Institute of Archaeology, Faculty of Arts, University of South Bohemia in České (terezasalkova@seznam.cz) ORCID 0000-0002-7429-5185

Hoards from the European Bronze and Iron Ages: Current Research and New Perspectives, ed. by Marcin Maciejewski, János Gábor Tarbay, and Kamil Nowak, NAA, 4 (Turnhout, 2024), pp. 53–67.
BREPOLS PUBLISHERS DOI 10.1484/M.NAA-EB.5.142437

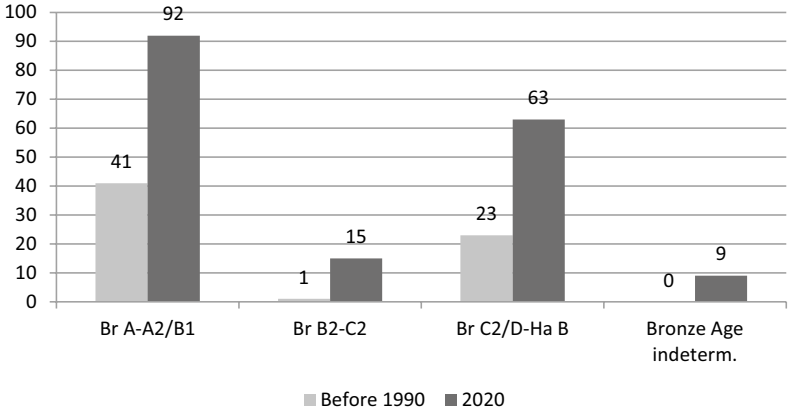


Figure 5.1. Current state of knowledge of Bronze Age hoards in southern Bohemia. Created by O. Chvojka.

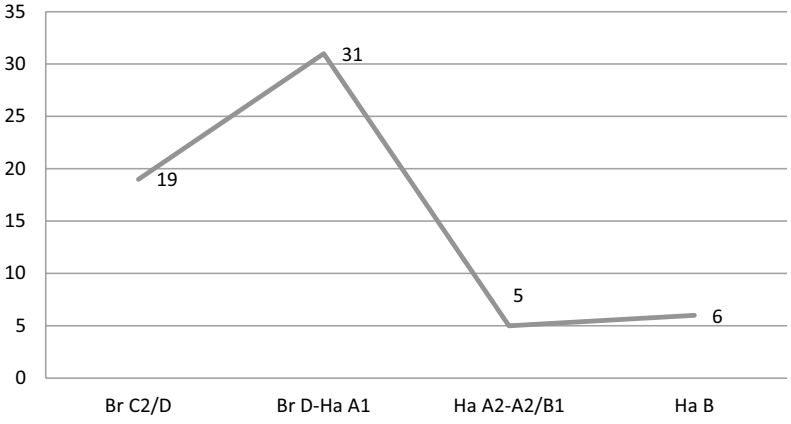


Figure 5.2. Chronological distribution of Urnfield-Period hoards in southern Bohemia. Created by O. Chvojka.

Today, almost 180 hoards of bronze, copper, and gold objects are known in southern Bohemia (Chvojka 2015), more than half of which are deposits from the Early to the beginning of the Middle Bronze Age (Fig. 5.1). Our focus, however, will on be hoards from the Urnfield Period (Br C2/D–Ha B), of which there are sixty-three known in this region today (i.e., 35 per cent of all Bronze Age hoards in south Bohemia). A significant increase in the number of hoards has been witnessed in the last thirty years: in 1990, only twenty-three deposits of the Late and Final Bronze Age were known in this region (Kytlicová 2007; Chvojka 2009, 153–55), so the forty newly discovered and documented hoards represent an increase of 173 per cent. The main reason for this is the mass expansion of the use of metal detectors in recent decades and the cooperation of at least some treasure-hunters with archaeologists.[1]

The current source base and state of knowledge of Urnfield-Period metal hoards in south Bohemia allow us to pose several questions, which we will focus on in the following article:

1) Topography of hoards: besides hoards from an 'open landscape', we have some hoards from settlements, hillforts, and in one case, a burial site, do hoards deposited in these situations exhibit a different character? Can the different topography of hoards (slopes, riverbanks, hilltops, etc.) provide clues for their interpretation?
2) Chemical analyses of artefacts from hoards. In recent years, many final products, their fragments, as well as ingots, have been analysed by XRF, NAA, and isotope analyses. Can these analyses contribute to the question of the origin of metals (copper, tin) and to our knowledge about the metallurgy of the Bronze Age?
3) Archaeobotany of hoards. Can the pollen analyses, and analyses of plant macroremains or charcoal contribute to our knowledge about the manner of and reasons for hoarding? Can they help us reconstruct the landscape in the surroundings of a hoard?

Chronology

Traditionally, the Bohemian hoards of the Urnfield Period are divided into four chronological horizons (Kytlicová 2007): 1) Br C2/D: Plzeň-Jíkalka horizon; 2) Br D–Ha A1: Lažany and Suchdol horizon; 3) Ha A2–Ha A2/B1: Středokluky and Jenišovice horizon; 4) Ha B2/3: Hostomice and Třtěno horizon. The occurrence of hoards in these horizons is different in individual Bohemian regions. The peak of the south Bohemian hoards of that time lies in the horizon Br D–Ha A1, i.e., in the time of the so-called hoards of fragments (Fig. 5.2). In total, nineteen hoards are known from the transitional horizon Br C2/D (Plzeň-Jíkalka horizon) between the Middle and Late Bronze Ages. On the other hand, hoards from the younger phases of the Urnfield Period (Ha A2–Ha B) are very rare in south Bohemia. The reason for such a significant decrease in the number of hoards is still not clearly explained; however, it is possible to assume a certain connection with the overall decrease in the settlement in the south Bohemian region at the end of the Bronze Age (Chvojka and others 2021).

1 Searching for archaeological artefacts using metal detectors is practically not covered by Czech law. In recent years, however, several models of legal mutual cooperation have been set up (see Mařík 2013; Komoróczy 2022).

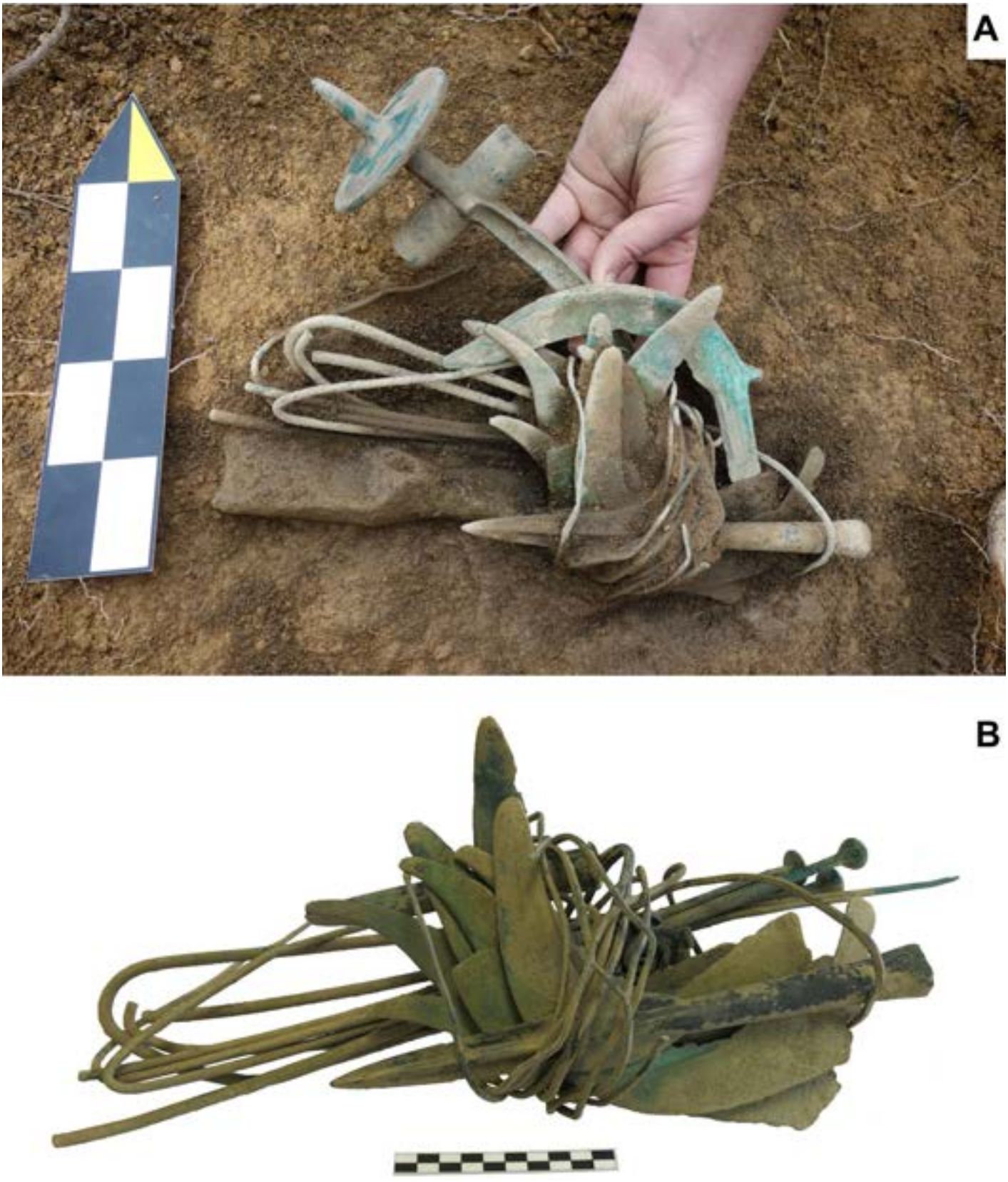


Figure 5.3. Všeteč. An example of a hoard (Br C2/D) documented in situ in the field (A) and subsequently after laboratory preparation (B). Photo by Ondřej Chvojka (A) and Jan John (B).

Composition and Size of the Hoards

The character and size of the south Bohemian hoards of the Late and Final Bronze Age are highly variable. However, for analyses or even statistical evaluation of the number and representation of individual types of artefacts, the problem is that in the vast majority of hoards, it is not certain whether they have been preserved, found, or handed over completely. Thus, small or unattractive objects were not necessarily recognized and picked up by the amateur finder at all, and, on the contrary, attractive objects were not necessarily handed over to museum collections or for a professional evaluation. The following conclusions are, therefore, to be considered indicative only.

In the first horizon (Plzeň-Jíkalka, Br C2/D), hoards of whole products predominate, and they usually contain several dozen of artefacts (Kytlicová 1964). In some deposits, fragments of cake-shaped ingots also appear, but their number is usually not large. The mostly undamaged products are dominated by jewellery, tools, and weapons of the Middle Bronze Age character and are mostly of local origin. Only a few probably imported artefacts can be associated with an elite environment, such as a hammer-axe from the hoard near Všeteč (Fig. 5.3).

The dominant type of hoard from the Lažany and Suchdol horizon (Br D–Ha A1) are deposits of fragments which regularly contain a large number of ingots, and their parts, without any intentional structuring or selection in terms of specific parts of the original ingots or fragment sizes. Some of them are of considerable size — for example, the two largest south Bohemian hoards from Olešná contained 206 and 203 artefacts (Chvojka and others 2017, tables 109–23). The hoard from Staré Hodějovice consisted of seventeen fragments of bronze products and more than two hundred pieces of ingots and their fragments with a total weight of almost 30 kg (Kmošek and others 2020). On the other hand, hoards with a predominance of whole, undamaged products were deposited in this region even in this period, as shown, for example, by the ensemble from Staré Sedlo (Fig. 5.4; Kytlicová 2007, Taf. 23–24; Šálová 2015). In many hoards of this period, we encounter prestigious artefacts, such as bronze vessels (Fig. 5.5.1–2), hammer-axes from the Carpathian Basin (Fig. 5.5.5) and from the eastern Baltic (Fig. 5.5.3), etc.

Five hoards of the Středokluky and Jenišovice horizon (Ha A2–Ha A2/B1) represent small and mostly monotype complexes in this region. We can mention the hoard of seven necklaces from Albrechtice nad Vltavou (Kytlicová 2007, Taf. 131.A) or six identical sickles from Paseky (Fig. 5.6). Prestigious products include a set of two large fibulas from Vrcovice (Kytlicová 2007, Taf. 131.B) or a similar fibula from the vicinity of Držov (Fig. 5.5.4).

Figure 5.4. Staré Sedlo. Hoard of mostly complete products from the Br D–Ha A1 stages (after Šálová 2015, fig. 1).

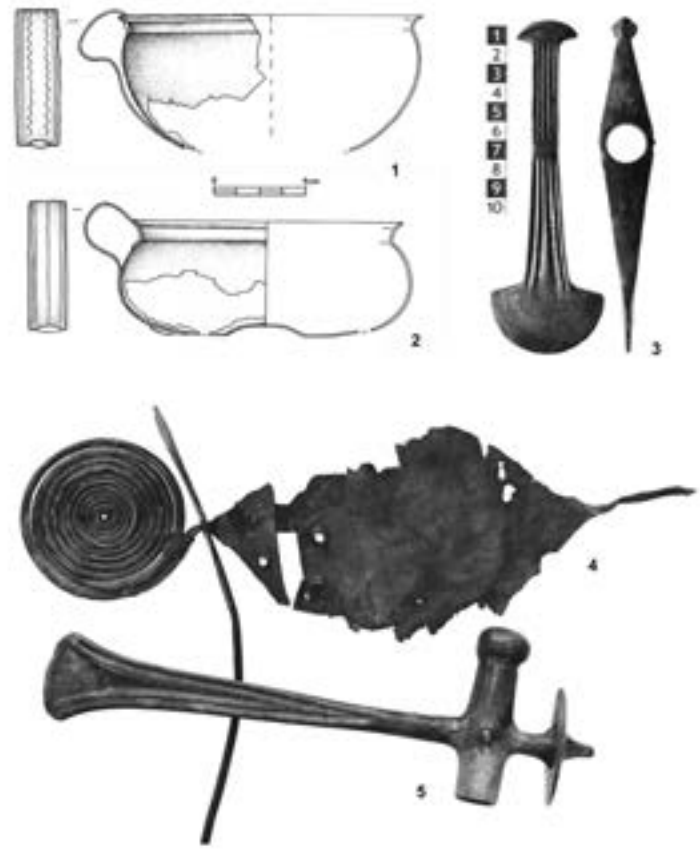


Figure 5.5. Examples of prestigious artefacts from the Urnfield-Period hoards from southern Bohemia. 1–3: Olešná 2 (after Chvojka and John 2018); 4: Držov; 5: Paseky. Photo by J. John.

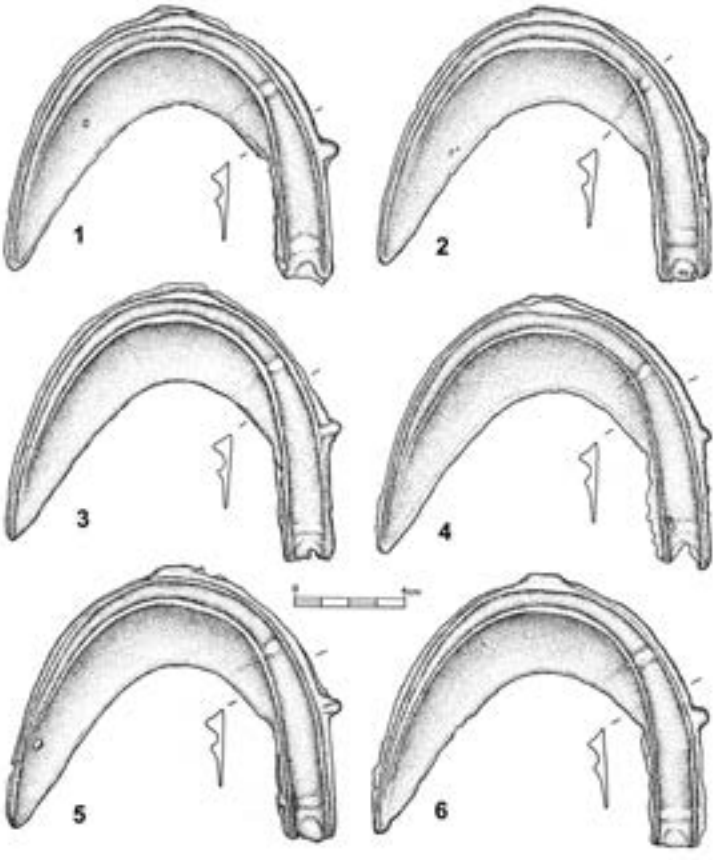


Figure 5.6. Paseky. A hoard of six identical sickles (after Fröhlich and others 2015, fig. 6).

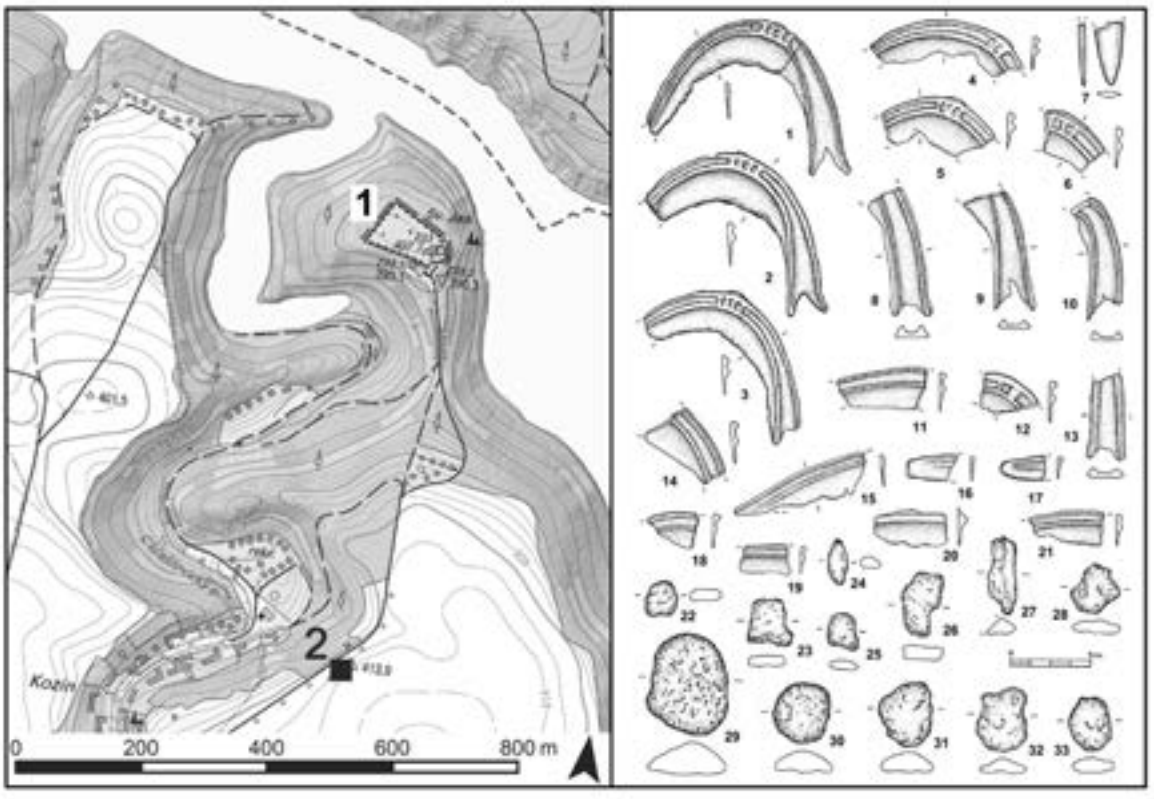


Figure 5.7. Chřešťovice. Spatial connection between the Final Bronze Age hillfort (no. 1) and a hoard of the same time (no. 2) (after Fröhlich and others 2016, figs 1 and 8).

Six Final Bronze Age hoards of the Hostomice-Třtěno horizon (Ha B2–3) are of variable character. In addition to a small monotype hoard of two axes (Putim: Chvojka and others 2017, table 137: 1–2) and a small multi-type deposit of four artefacts (Skočice: Chvojka and others 2017, table 142: 3–6) we have also encountered a complex of several tens of broken artefacts and ingots (Chřešťovice: Fig. 5.7).

Hoards and Settlement Structure

The spatial distribution of hoards mostly reflects the settlement structure of that time. Some of the hoards are also situated in unsettled areas (especially in the Šumava Mountains in the south-western part of the region), and others are concentrated in some important locations, such as in the vicinity of the confluence of two main south Bohemian rivers Otava and Vltava in the transitional period Br C2/D (Fig. 5.8) or the area of the Písecké Mountains in the stages Br D–Ha A1 (Fig. 5.9). On the other hand, no concentration of hoards is observed in the Final Bronze Age (Fig. 5.10).

A very important question that we focus on in this article is the relationship between hoards and settlement structure. The vast majority of south Bohemian hoards of the Urnfield Period were found isolated, without any clear connection to the known settlements or burials. Only five hoards were discovered in the areas of **flatland settlements**, which is well documented by the examples of two hoards from Rataje near Bechyně (Fig. 5.11; Chvojka and others 2018). Unfortunately, it is not certain whether both of these hoards, datable to the stages Br D–Ha A1, were contemporary with the settlement, but this cannot be ruled out. Both hoards were placed outside the settlement features — one was sunk in the cultural layer and the other in the subsoil on the edge of the Late Bronze Age settlement. The south Bohemian hoards found in the areas of flatland settlements are mostly sets of fragments in their character (e.g., Paseky 1 and 2: Chvojka and others 2017, tabs 124–29; Rataje 2: Chvojka and others 2018, figs 12–16); the only exception is the hoard Rataje 1 (Fig. 5.11, B), which consisted of a copper ingot placed between two ceramic vessels (Chvojka and others 2018, figs 7–9). The presence of fragments and ingots in those hoards suggests their connection with metallurgical activities in the areas of the settlements, but this is only an unconfirmed hypothesis so far.

Three hoards were deposited near the **hillforts**, but not in their inner areas, as is well known from other regions (in Bohemia, e.g., Plešivec: Kytlicová 2007,

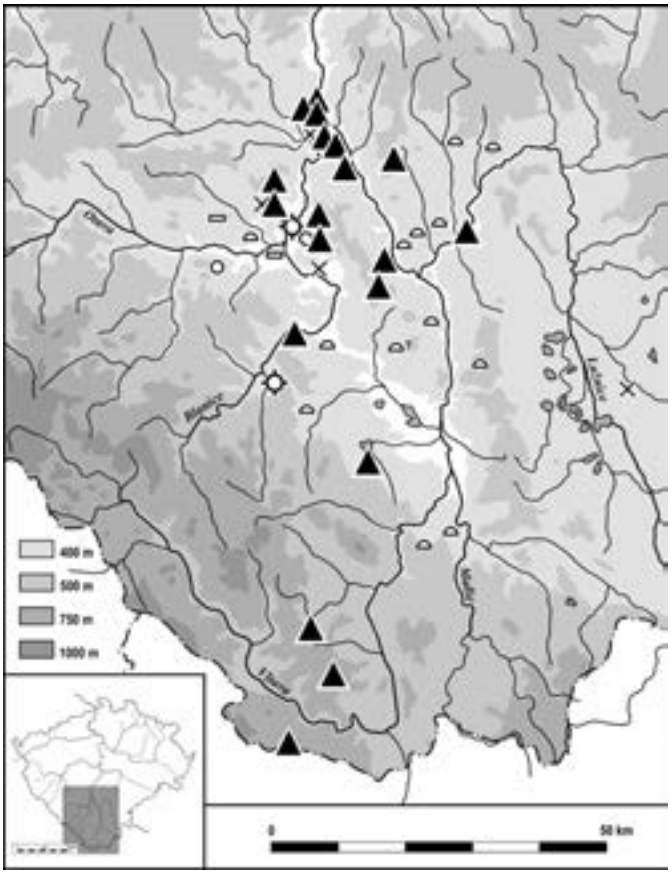


Figure 5.8. Metal hoards (black triangles) of the stages Br C2/D in southern Bohemia (modified after Chvojka 2009, fig. 9).

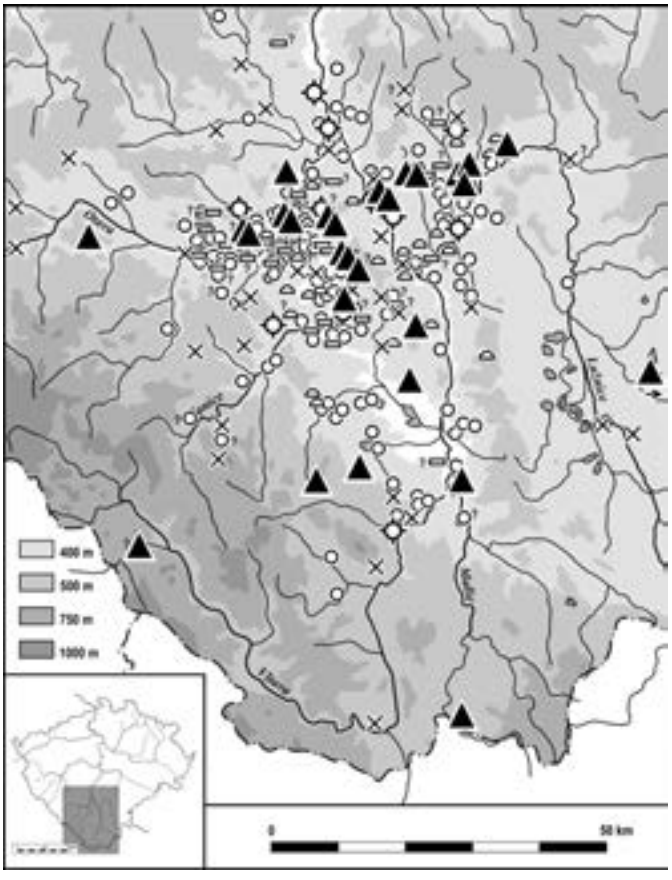


Figure 5.9. Metal hoards (black triangles) of the stages Br D–Ha A2/B1 in southern Bohemia (modified after Chvojka 2009, figs 10–11).

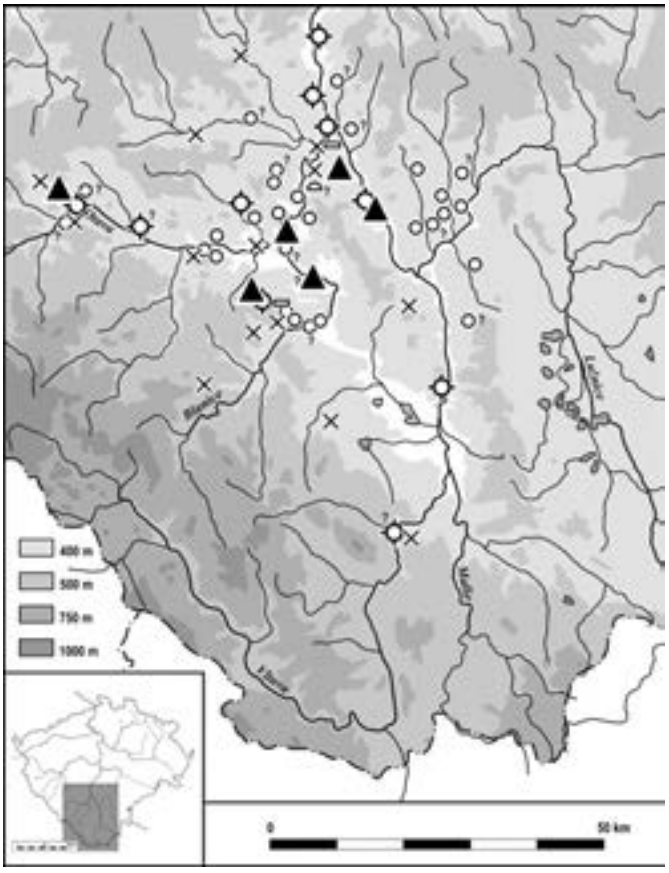
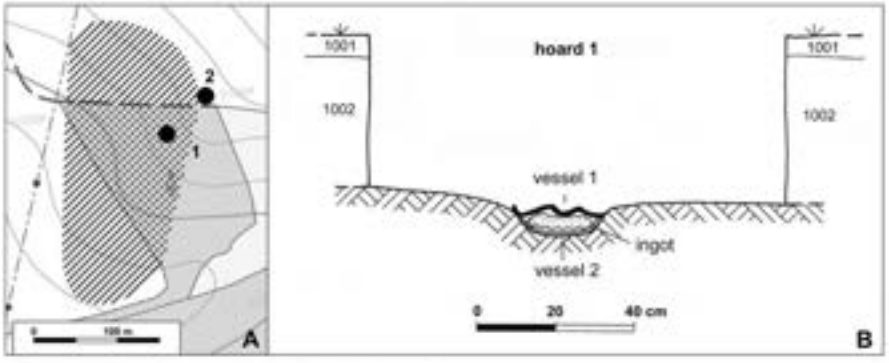


Figure 5.10. Metal hoards (black triangles) of the stages Ha B1–3 in southern Bohemia (modified after Chvojka 2009, fig. 12).



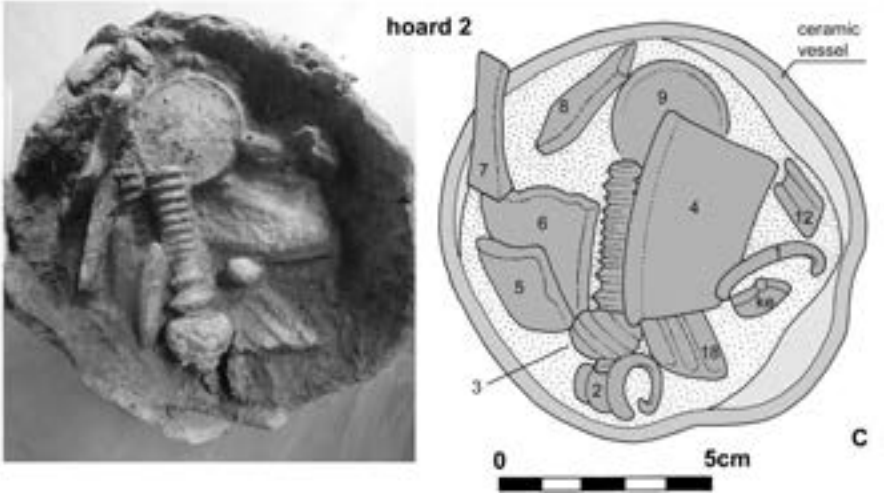


Figure 5.11. Rataje. A: location of two hoards in the area of the Late Bronze Age settlement (hatched); B: profile of the settlement layer (1002) with hoard no. 1; C: hoard no. 2 in a ceramic container (after Chvojka and others 2018).

Figure 5.12. Krtely. Hoard of bronze products, their fragments, and copper ingots from a burial mound. Plan made by J. John, photo by O. Chvojka.

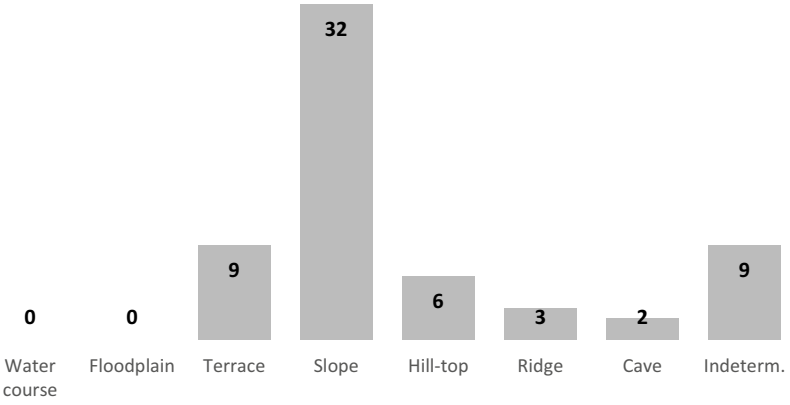


Figure 5.13. Classification of south Bohemian Urnfield-Period hoards after their topography. Created by Ondřej Chvojka.

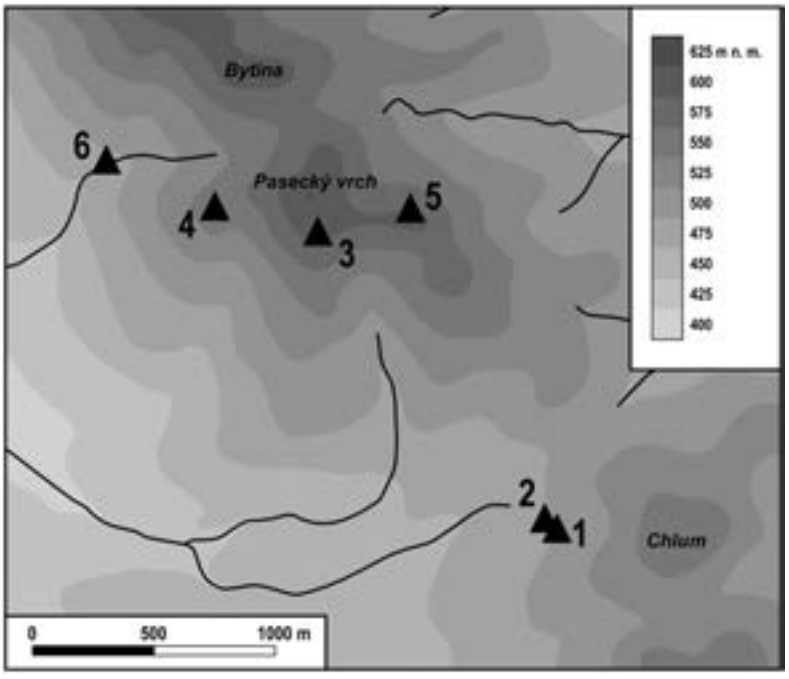


Figure 5.14. Paseky. Topography of six hoards (Br D–Ha A) in the Písecké Mountains. Drawing by K. Vávra.

289–91, Taf. 32–38; Lžovice: Kytlicová 2007, 280–83, Taf. 190–97; Velim-Skalka: Hrala and others 2000, 220–30; in summary Vachta 2016, 111–33, Abb. 51). The south Bohemian hoards of the Final Bronze Age from Skočice (Chvojka and others 2017, 140) and Chřešťovice (Fig. 5.7; Fröhlich and others 2016) were located a few hundred metres away from the edges of the fortified settlements with some evidence of human activities of that time. These hoards are of different characters: while the hoard from Skočice contained four whole artefacts, the set from Chřešťovice comprised thirty-three fragments (especially sickles) and ingots. However, none of these hoards contained an artefact of a clearly prestigious nature which could be associated with the possible presence of elites in these hillforts.

The **hoard from a burial mound** in the barrow cemetery near Krtely (Fig. 5.12), which was discovered in 2017, is still the only deposit from a grave context in south Bohemia. However, the site has not been professionally investigated yet, so we do not know the chronology of the tumuli nor the connections between the hoard and the burial mound (Chvojka and others 2024). This is the only hoard of the Urnfield Period in the whole of Bohemia found in that milieu. Some other examples are known from other European necropolises (e.g., Hansen 1994, 324; Falkenstein 2011, 89–90). There are more possible interpretations of those hoards: sacrifices/memoria to deceased ancestors, inheritance of deceased ancestors (Šteffl 2014, 90–96), or 'burials of bronzes' (Hansen 1994, 386). Unfortunately, the unclear find circumstances of the hoard from Krtely and its unclear connection to the as yet unexplored burial in the mound do not allow a closer interpretation of this find.

The hoard from Krtely comprises a typical complex of bronze artefacts and their fragments, as well as some raw copper ingots from the period of Br D–Ha A1. Only one artefact is exceptional in south Bohemia — a broken mining pickaxe analogical to those found in salt mines in Hallstatt and in some hoards in Austria and Transylvania (Höglinger 1996, 41–45; Jiráň 2000, Abb. 1). The only analogy in Bohemia is a fragment of the mining pickaxe from another south Bohemian hoard in Holašovice (Kytlicová 2007, Taf. 21.22). In these artefacts, we can perhaps see evidence of contacts with the Alpine region in the Late Bronze Age.

Topography

There are some interesting observations in terms of the relationship of Urnfield-Period hoards to the landscape in south Bohemia. In this region, we do not have any hoards from watercourses or floodplains; most of the hoards were found on slopes, terraces, and hilltops (Fig. 5.13). However, a major problem is a lack of exact find circumstances for most of the metal hoards. In recent years, there are only some exceptions, namely deposits left by responsible amateur finders undisturbed in the original finding places and reported to archaeologists, such as the hoard from Všeteč found in 2020 (Fig. 5.3). This hoard, which consists of thirty-three mostly intact products from the turn of the Middle and Late Bronze Age (including several exceptional ones, such as a hammer-axe from the Carpathian Basin), was deposited in a conspicuous position with a view of the surrounding area.

A very good example of various topographies of the hoards from the same period (Br D–Ha A) is the landscape around Paseky village in the Písecké

Mountains (Fröhlich and others 2015). Currently, there are six known hoards; while one of them is situated on a hilltop, there are other two others on ridges and three on slopes (Fig. 5.14). While the hoards on the slopes (Fig. 5.14: 1.2.6) and one on a ridge (Fig. 5.14: 5) have the character of hoards of fragments, both hoards from the hilltop (Fig. 5.14: 3) and from the high ridge (Fig. 5.14: 4) of a dominant hill (Pasecký vrch, 625 m), with an excellent view of the surroundings, represent hoards of mostly unbroken products. Among them, very special is a set of six identical semi-finished sickles (Fig. 5.6), which were placed in triplets against each other so that they formed an approximate circle. These find circumstances in connection with the striking topographic position allow for the interpretation of this find as a votive or symbolic sacrifice.

Chemical Analyses

A number of metal artefacts from south Bohemian hoards have recently been analysed using the X-ray fluorescence (XRF) method in order to determine their elemental composition. These measurements often provide interesting information in terms of differences in the chemical composition of individual types of artefacts. For example, impact working tools, e.g., the pickaxe from Krtely (Fig. 5.12), or a hammer from Skočice (Chvojka and others 2017, table 142: 3), show the highest tin contents from the entire set of artefacts in the hoard. This can be explained by the effort to achieve maximum wear resistance of tools intended for working with durable materials. By contrast, sickles are usually relatively weakly alloyed with tin.

In the case of typologically identical or similar artefacts (e.g., cups from Olešná 2 — Fig. 5.5: 1–2 or sickles from Paseky — Fig. 5.6), sometimes we can see their very similar elemental composition as well, which probably indicates their origin in the same workshop or area (Table 5.1).

XRF analysis of the hoard from Krtely showed that finished bronze products have a significantly higher lead content than copper ingots from the same hoard (Fig. 5.15). This probably means that lead was added to copper during its alloying or comes from the recycling of older artefacts.

Thus, if we want to trace the origin of copper using lead isotopes, it is essential to examine 'raw' copper ingots rather than finished artefacts in which lead came from various sources.

Very important results were provided by multiple analyses of a hoard from Staré Hodějovice (Kmošek and others 2020). This hoard, which was discovered in 2014 and which is dated to Br D–Ha A1, produced almost 30 kg of raw copper in the form of plano-convex as well as flat ingots and their fragments. Three chemical analyses have been carried out: 1) analyses of major and trace elements, 2) microstructural and microprobe analyses, and 3) lead-isotope analyses. The results of the material analyses of ingots from the Staré Hodějovice hoard provide new information about metallurgical production and copper distribution in the Late Bronze Age. The analysed ingots comprise mostly non-refined and non-alloyed raw copper. Based on the chemical

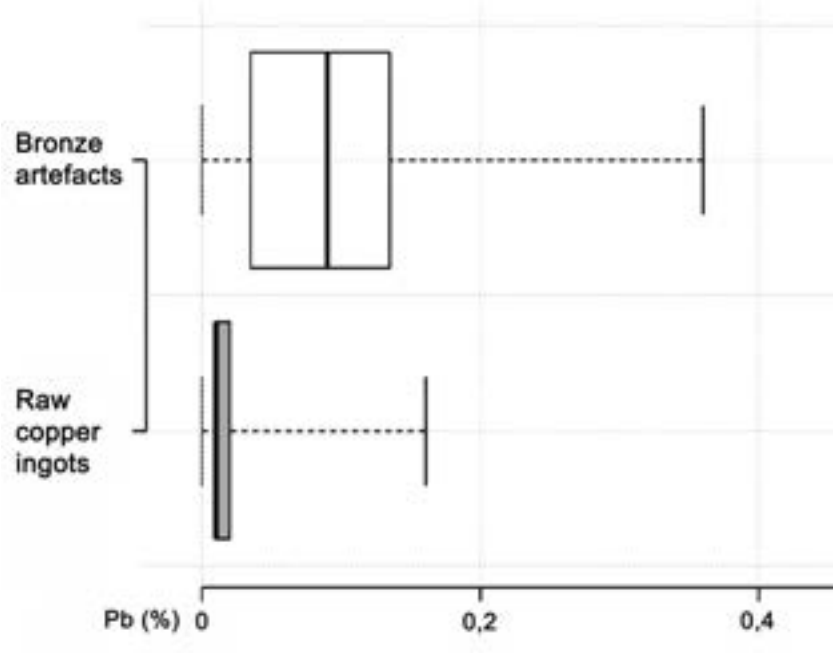


Figure 5.15. Box plot of lead content in final products and copper 'cake' ingots from the Krtely hoard (unpublished data). Values are given in percentages. Created by Jan John.

Table 5.1. Results of portable XRF analyses of sickles from the Paseky hoard (Fröhlich and others 2015) and cups from Olešná 2 (unpublished data). Values are given in percentages. Increased tin values are caused by measuring the corroded surface of the cups.

Paseky	Cu	Sn	Sb	Pb	As	Ni
sickle 1	94.91	2.23	0.39	0.35	0.90	0.58
sickle 2	94.33	3.80	0.20	0.10	0.49	0.34
sickle 3	94.74	2.47	0.34	0.35	0.85	0.60
sickle 4	94.28	2.88	0.29	0.62	0.72	0.55
sickle 5	94.05	4.07	0.22	0.09	0.49	0.39
sickle 6	94.20	3.26	0.28	0.38	0.63	0.50
Olešná 2						
cup 1	85.45	12.62	0.28	0.32	0.41	0.40
cup 2	86.71	12.50	0.06	0.09	0.16	0.26

composition and microstructural analyses, we suppose that most of the ingots are not altered by alloying, mixing, or recycling. Chemical analyses support our assumptions about the origin of south Bohemian copper. The most likely origin of ores in the Late Bronze Age is the Alps (Fig. 5.16). For the first time, we have some evidence that unrefined smelted copper from various Alpine sources (Mitterberg, Trentino, and possibly Valais regions) was concentrated, and most probably mixed in one find complex in Bohemia. From a metallurgical point of view, it represents important evidence of copper mixing. To date, we have no certain find of an LBA metallurgical workshop in southern Bohemia. We can therefore refute the hypothesis that south Bohemia was merely a transport region for Alpine copper; now, we have some evidence that the copper came to this region from various sources and was refined, alloyed, and cast into the final form there.

Archaeobotanical Analyses

Remains of organic materials are relatively frequently preserved in archaeological sediments. In the case of plants, these are usually remains of (charred or water-preserved) plant macro-remains and pollen grains. Corrosion products from copper and bronze artefacts can cause the preservation of other organic materials that have been in contact with the metal. Of the less common types of analysis, gas chromatography in combination with mass spectrometry can also be used to study the presence of organic matter in hoard finds (e.g., Karg and others 2015). The presence of proteins can be examined by mass spectrometry and the detection of food antibodies (e.g., Pavelka and others 2016). Organic residues in metal artefact hoard find make it possible to reconstruct the processes that artefacts went through before and during a deposition in the ground and, in some cases, post-deposition processes. It is also possible to reconstruct the character of the environment in the near vicinity of the hoard and further from it. Organic residues also allow radiocarbon dating.

In the south Bohemian area, the Rataje 1 and Rataje 2 hoards (Fig. 5.11) are a model example of research on organic remains (Chvojka and others 2018). Hoard 1 contained a large amount of non-carbonized (copper-preserved) plant remains in the immediate vicinity of the copper ingot. Small amounts of non-carbonized plant remains were found in control samples taken from outside the ceramic vessels, and the concentration of carbonized remains was relatively high. In hoard 1, archaeobotanical analysis succeeded in capturing the processes directly related to the hoard find (placing the flax stalks in a vessel with an ingot and covering it with another vessel), as well as the place where the container was stored (although it is not possible to reconstruct whether the hoard find was stored during the life of the settlement). Hoard 2 is, from an archaeobotanical point of view, the opposite of the first. Although the environment should be ideal for preserving the organic remains (bronze artefacts stored in a ceramic vessel), no plant remains were found. However, corrosion products were released from the bronze artefacts (a large amount of blue and green fragments from these were found in the flotation residues). It is not possible to reconstruct whether the plants/their parts were not in the vessel at all or whether they were for some reason not preserved.

Discussion and Conclusion

The more than sixty south Bohemian hoards of metal artefacts from the Late and Final Bronze Age constitute a highly variable archaeological source. The individual deposits differ from each other in the character of their composition, and the number of artefacts present, their topographic characteristics, and their connection to the contemporary settlement structure. Undoubtedly, their interpretations will also vary.

If we combine information on the nature, amount, and method of deposition of artefacts in a particular hoard with data on the topographic characteristics of the location of the deposit, it is possible to determine with some degree of probability several interpretive models of south Bohemian hoards of the observed period:

1) *Hoards of a trade or production nature*. Hoards comprising predominantly damaged, non-functional, and fragmented artefacts and ingots or pieces of slag, or even semi-finished products can indicate the direction of long-distance roads (e.g., if they occur near significant watercourses or in mountain valleys) or the existence of a local metallurgical workshop.

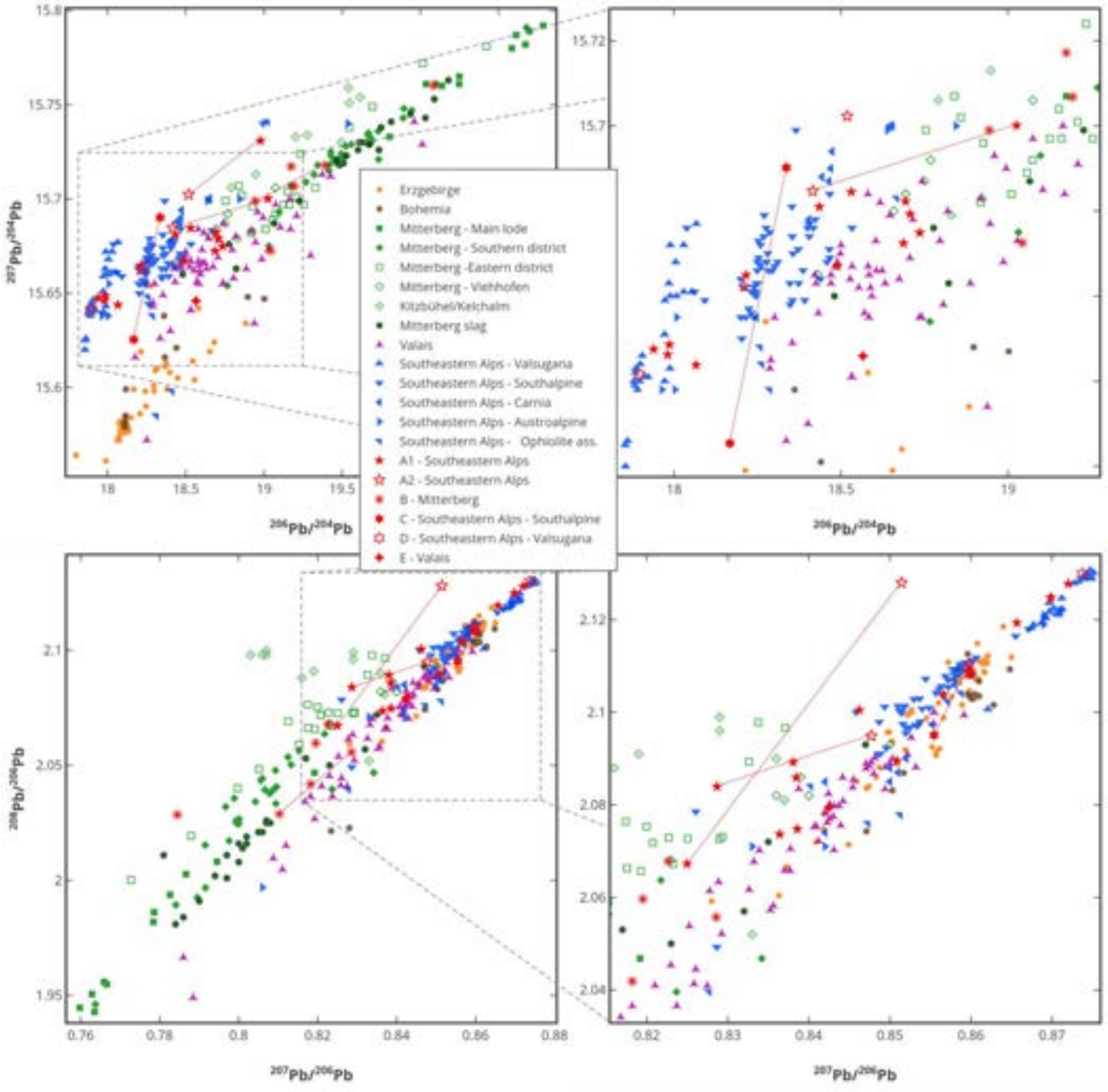


Figure 5.16. Staré Hodějovice. Comparison of the lead isotope ratios $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$ and $^{207}Pb/^{206}Pb$, $^{208}Pb/^{206}Pb$, of the analysed samples with copper ore and slag from the Erzgebirge, Bohemian Massif, Mitterberg region, Valais region, and south-eastern Alps region (after Kmošek and others 2020, fig. 8).

Typical examples are large fragmentary deposits of stages Br D–Ha A1, some of which are in the areas of (contemporary?) flat settlements (Rataje, Paseky 1 and 2), near assumed roads (e.g., Olešná 1 and 2 by the River Vltava), or near an assumed production facility (Staré Hodějovice).

2) *Hoards of a prestigious nature*. Some hoards comprise artefacts that can be connected to the elite environment (cf. Fig. 5.5), but so far, we lack a deposit that only contains prestigious products. Even from a topographic point of view, the connection of deposits with prestigious products to elite settlements (fortifications) has not yet been proved. With a few exceptions, we also lack products from precious raw materials (gold, silver, amber) in the south Bohemian hoards from the period under review. For now, the south Bohemian hoards of the observed period can be considered as sets of the most common products or available raw materials, only sometimes with an admixture of exceptional artefacts.
3) *Hoards as a memorial to the deceased*. The only such ensemble in southern Bohemia could be the hoard from Krtely, which was deposited in an (older?) mound (Fig. 5.12). Two alleged deposits could also come from the burial grounds or near them, unfortunately, they were discovered in the nineteenth century without further information on the circumstances of discovery, perhaps in the mounds near Vrcovice and Albrechtice nad Vltavou (Kytlicová 2007, Taf. 131). However, the absence of modern excavations of these sites prevents their closer interpretation (see Chvojka and others 2024).
4) *Votive offerings*. In southern Bohemia, we lack hoards from watercourses or swamps, for which their sacrificial character can be assumed rather unambiguously; nevertheless, some of the hoards can be considered votive (permanent) deposits. This mainly includes deposits from conspicuous locations, which are linked to significant natural formations (rocks, springs, etc.). The landscape of the Písecké Mountains, which separated the heavily populated valleys of the Otava and Vltava Rivers, is striking in this respect. It is in the Písecké Mountains that there is a notable concentration of hoards of stages Br D–Ha A, many of which come from striking locations with a wide view of the landscape. An example is the above-mentioned deposits from the Paseky area, especially the hoard of six identical unfinished sickles (Fig. 5.6) in a specific position. We assume that at least some of such deposits were placed in the ground permanently as votive offerings.

However, we must admit that the above classification is only hypothetical and may not reflect the meaning and significance of these hoards in the societies of that time. Nevertheless, with the help of natural sciences and chemical analyses, it is possible to approach, at least in some cases, the interpretation of a given finding, as some of the above examples suggest.

Acknowledgements

The creation of this article was supported by a project of the Czech Science Foundation (GAČR), reg. no. 23-06940S.

Works Cited

Chvojka, Ondřej. 2009. *Jižní Čechy v mladší a pozdní době bronzové*, Dissertationes archaeologicae Brunenses/Pragensesque, 6 (Brno: Masarykova Universita)

——. 2015. 'Bronzezeitliche Metallhortfunde in Südböhmen. Aktueller Forschungsstand', *Fines transire*, 24: 49–65

Chvojka, Ondřej, Daniel Hlásek, and Petr Menšík. 2017. 'Mitteleuropäische Kontakte der südböhmischen Bronzezeit', *Fines transire*, 26: 133–45

Chvojka, Ondřej, Daniel Hlásek, and Tereza Šálková. 2021. 'Aktuální stav poznání doby bronzové v jižních Čechách', in *Pravěké komunity vnitřní periferie: Vývoj osídlení jižních Čech od 9. do počátku 1. tisíciletí př. Kr.*, ed. by Václav Vondrovský and Ondřej Chvojka (České Budějovice: Jihočeská univerzita v Českých Budějovicích), pp. 107–37

Chvojka, Ondřej, Luboš Jiráň, Milan Metlička, Jaroslav Frána, Petra Houfková, Jan John, and Tereza Šálková. 2017. *Nové české depoty doby bronzové: Hromadné nálezy kovových předmětů učiněné do roku 2013* (České Budějovice: Jihočeská univerzita v Českých Budějovicích)

Chvojka, Ondřej, and Jan John. 2018. 'Sekeromlat typu Nortycken z depotu v Olešné (okr. Písek)', in *Sídla, artefakty a čas… Zborník štúdií o dobe bronzovej a dobe halštatskej k 75. narodeninám Ladislava Veliačika*, ed. by Lucia Benediková and Milan Horňák (Nitra: Archeologický ústav SAV), pp. 153–62

Chvojka, Ondřej, Jiří Beneš, Jan John, and Tereza Šálková. 2018. 'Nové depoty doby bronzové z Bechyňska', *Archeologické výzkumy v jižních Čechách*, 31: 45–86

Chvojka, Ondřej, Luboš Jiráň, Jan John, Matěj Kmošek, Richard Thér, and Tomáš Zachar. 2024. 'Hoard from the Late Bronze Age with a Miner's Pick from Krtely (Prachatice district – South Bohemia): On the Question of the Relations of Hoards, Imports and Burial Mounds of the Urnfield Period', *Archeologické rozhledy*, 76: 221–56.

Falkenstein, Falko. 2011. 'Zu Struktur und Deutung älterurnenfelderzeitlichen Hortfunde im nordalpinen Raum', in *Bronzen im Spannungsfeld zwischen praktischer Nutzung und symbolischer Bedeutung: Beiträge zum internationalen Kolloquium*, ed. by Ute Luise Dietz and Albrecht Jockenhövel, Prähistorische Bronzefunde, 20.13 (Stuttgart: Steiner), pp. 71–105

Fröhlich, Jiří, Ondřej Chvojka, and Jan John. 2015. 'Čtyři mladobronzové depoty z vysokých poloh Píseckých hor', *Archeologické výzkumy v jižních Čechách*, 28: 101–18

Fröhlich, Jiří, Ondřej Chvojka, and Tereza Šálková. 2016. 'Kovové depoty z doby bronzové v zázemí hradiště u Chřešťovic na Písecku', *Archeologické výzkumy v jižních Čechách*, 29: 117–41

Hansen, Svend. 1994. *Studien zu den Metalldeponierungen während der älteren Urnenfelderzeit zwischen Rhônetal und Karpatenbecken*, Universitätsforschungen zur prähistorischen Archäologie, 21 (Bonn: Habelt)

Höglinger, Peter. 1996. *Der spätbronzezeitliche Depotfund von Sipbachzell/OÖ*, Linzer Archäologische Forschungen, Sonderheft, 16 (Linz: Stadtmuseum Linz)

Hrala, Jiří, Radka Šumberová, Miloš Vávra, and Anthony F. Harding. 2000. *Velim: A Bronze Age Fortified Site in Bohemia* (Prague: Institute of Archaeology, Academy of Sciences of the Czech Republic)

Jiráň, Luboš. 2000. 'Die Frage nach den Rohstoffquellen der urnenfelderzeitlichen Bronzeproduktion in Böhmen', in *Archäologische Arbeitsgemeinschaft Ostbayern/West- und Südböhmen: 9. Treffen, 23. bis 26. Juni 1999 in Neukirchen b. Hl. Blut*, ed. by Miloslav Chytráček, Jan Michálek, and Karl Schmotz (Rahden: Archäologische Arbeitsgemeinschaft Ostbayern), pp. 61–67

Karg, Sabine, Ulla U. Lund Hansen, Anne Margrethe Walldén, Jens Glastrup, Henrik Ærenlund Pedersen, and Finn Ole Sonne Nielsen. 2015. 'Vegetal Grave Goods in a Female Burial on Bornholm (Denmark) from the Late Roman Iron Age Period Interpreted in a Comparative European Perspective', *Danish Journal of Archaeology*, 3: 52–60

Kmošek, Jiří, Yulia V. Erban Kochergina, Ondřej Chvojka, and Marek Fikrle. 2020. 'Tracking Alpine Copper – Analysis of Late Bronze Age Copper Ingot Hoard from South Bohemia', *Archaeological and Anthropological Sciences*, 12.234: 1–21

Komoróczy, Balázs. 2022. 'Archaeology, Metal Detecting, and Citizen Science in the Czech Republic', *Advances in Archaeological Practice*, 10.3: 322–35

Kytlicová, Olga. 1964. 'K časovému zařazení depotů horizontu Plzeň-Jíkalka', *Archeologické rozhledy*, 16: 516–56, 562–63

——. 2007. *Jungbronzezeitliche Hortfunde in Böhmen*, Prähistorische Bronzefunde, 20.12 (Stuttgart: Steiner)

Mařík, Jan. 2013. 'Amateurs and Professional Archaeologists: Legal Models for their Cooperation in the Czech Republic', in *Who Cares? Perspectives on Public Awareness, Participation and Protection in Archaeological Heritage Management*, ed. by Agneta Lagerlöf, European Archaeological Council Occasional Papers, 8 (Jambes: Archaeolingua), pp. 105–08

Pavelka, Jaroslav, Ladislav Šmejda, Radovan Hynek, and Štepánka Hrdličková Kučková. 2016. 'Immunological Detection of Denatured Proteins as a Method for Rapid Identification of Food Residues on Archaeological Pottery', *Journal of Archaeological Science*, 73: 25–35

Šálová, Markéta. 2015. 'Bronze Hoard from Staré Sedlo, District Tábor', *Fines transire*, 24: 149–53

Šteffl, Jindřich. 2014. *Depoty z období popelnicových polí v Čechách a Sasku* (Plzeň: Západočeská univerzita)

Vachta, Tilmann. 2016. *Bronzezeitliche Hortfunde und ihre Fundorte in Böhmen*, Topoi — Berlin Studies of the Ancient World, 33 (Berlin: Topoi)

ESTELLE GAUTHIER AND JEAN-FRANÇOIS PININGRE
WITH THE ASSISTANCE OF HERVÉ GRUT, PATRICK MOSCA, PATRICK GUILLOT, AND RENÉ PARISOT, VOLUNTEER ARCHAEOLOGISTS, FRANCE

6. An Active Search for Hoards? Contributions of a Systematic Field Survey to the Knowledge of Bronze Age Metal Hoarding

The Case Study of Salins-les-Bains, Jura, France

▾ **ABSTRACT** This article presents the results of a systematic metal-detecting survey conducted around the fortified settlement of Camp du Château in Salins-les-Bains (Jura, France). In this area, the hoards were few in number and poorly known for a long time. Between 2000 and 2021, the survey revealed seventy-four new hoards, marking a significant increase in our knowledge of metal hoarding in this micro-region. The article discusses the methodology employed in the survey, including meticulous excavation and GPS mapping, which allowed for a detailed analysis of the different aspects of hoarding practices. Then, the article successively examines the quantitative and qualitative contributions of this active search for hoards. The composition, chronology, burial conditions, context, and spatial distribution of the hoards are examined in turn. The results highlight particular burial practices and special choices of location that do not correspond to the traditional image of bronze hoards. These findings challenge traditional interpretations of hoards as mere hiding places or stocks for metalworkers. Instead, the observations suggest that the hoards may reflect symbolic practices related to territorial marking and social organization within Bronze Age communities.

▾ **KEYWORDS** Bronze Age, hoards, metal-detecting survey, social practices, territorial marking

Introduction

Salins-les-Bains (Jura, France) constitutes one of the rare natural access points to the central Jura between the Saône plains and the Swiss plateau. This sector benefits from the presence of Triassic salt deposits and a contrasting relief, ideal for the establishment of several hillforts. Among them, the fortified site of the

Estelle Gauthier • University of Franche-Comté, CNRS-UMR 6249 — Chrono-Environnement, France (estelle.gauthier@univ-fcomte.fr) ORCID 0000-0001-9935-1924
Jean-François Piningre • CNRS-UMR 6298 — ArTeHis, France (jfrancois.piningre@orange.fr)

Hoards from the European Bronze and Iron Ages: Current Research and New Perspectives, ed. by Marcin Maciejewski, János Gábor Tarbay, and Kamil Nowak, NAA, 4 (Turnhout, 2024), pp. 69–90.
BREPOLS PUBLISHERS DOI 10.1484/M.NAA-EB.5.142438

Camp du Château was occupied in particular during the Middle/Late Bronze Age transition. The area of Salins-les-Bains was, therefore, favourable for sustaining a dense population organized around a central power. Yet, until the 1990s, Bronze Age discoveries were relatively few in the area. The metal hoards were only represented by seven small finds that have nowadays partially or completely disappeared.

Since the beginning of the 2000s, a metal-detecting field survey programme which aims to be systematic, has been carried out within a strictly legal and scientific framework in the surroundings of the Camp du Château. To date, seventy-four new hoards have been found, most of them within a radius of 10 km of this fortified hilltop settlement.

This chapter aims to present the qualitative and quantitative impact of these discoveries in order to demonstrate the benefit of a systematic search for hoards in a defined area. The observations made on these discoveries led us to revisit the interpretation of hoarding as a deliberate and organized practice, related to the social and cultural structuring of the territory during the Bronze Age.

Project and Methodology

Old Discoveries

Our perception of traditions within protohistoric societies is based on the repetitive and symbolic nature of some archaeological finds mainly coming from funerary or religious contexts. Some of these community acts left more or less easily interpretable traces, such as the Bronze Age hoards placed in isolated contexts, away from settlements and cemeteries. Their interpretation is, in fact, still the subject of debate (e.g., Bradley 1990; Hansen 1994; Kristiansen 2000). The main hypotheses consider them as hiding places in times of insecurity, stocks of metal waiting to be remelted, or votive offerings. If this practice, although very frequent and common to all European Bronze Age cultures, remains very poorly understood, it is in particular because we are lacking, in most cases, precise observations on how these hoards were originally buried. Only the analysis of these aspects makes it possible to better understand the actions related to hoarding metal objects in the ground.

The formerly known hoards in the sector of Salins-les-Bains are no exception. Although several hoards from the Franche-Comté occupy a prominent place at the national level (Briod, Larnaud in particular, Coutil 1914; Piningre and others 2023), the area of Salins-les-Bains was poorly represented until the early 2000s. Only seven small hoards were known there (Millotte 1963). One of them dates from the Early Bronze Age (La Chapelle-sur-Furieuse), and another from the early Middle Bronze Age (Clucy village). Most of them are dated to the Late Bronze Age (Clucy-Champ à la Dame, Saint-Thiébaud-Mont-Poupet). Others are not datable within the period (Grozon, Clucy-Tsernot).

The localization of these old discoveries is very imprecise. The general location of the find-spots is sometimes specified ('Bois de la Chaux', 'La Noirie', 'Côte de Pouroz'), but these are not always clearly identifiable today (e.g., 'Tsernot' or 'Charnoz'?). Sometimes we have only a rather vague geographical indication such as 'at the top of Mont Poupet', 'in the trench of the path from Clucy to Cernans'; 'at the foot of the Pouroz coast'; 'Bois-de-la-Chaux, between Grozon and Poligny'. For the Clucy village hoard (found before 1853), the only indication we have is that it was found: 'towards the last house of the village, to the north'. It is, therefore, very complicated to place these discoveries on a map, and totally impossible to locate their exact find places.

These are mostly very small assemblages (five axe-heads at Clucy village, three axe-heads at Chapelle-sur-Furieuse, and three others from the top of Mont Poupet). The Grozon hoard is an exception, but we only know that it contained around eighty objects; its exact composition remains totally unknown. Even for small assemblages, the number of objects is uncertain; it may vary according to the different inventories. Most of these objects are either lost or can no longer be identified with certainty in museum collections.

As we can see, such finds provide little information to reconstruct and understand the gestures that led to the burial of the bronzes: we do not know the depth, and even less the position of the objects. Their spatial distribution is probably not representative of either the population nor of the hoarding phenomenon itself. As the bronze objects have disappeared or cannot be precisely identified, it is also impossible to study the effects of selections (functional categories, which part is present if the object is fragmentary) or even the treatments undergone by the objects before their burial (e.g., traces of use, deliberate fragmentation).

The uncertainties and imprecisions relating to these discoveries are symptomatic of the old finds that represent the vast majority of the hoards inventoried until recently. Unfortunately, the improvement of the recording methods or even the development of rescue archaeology has not significantly boosted the knowledge of Bronze Age metal hoarding, as the proportion of recent and well-recorded discoveries is very low. Relying only on old and fortuitous discoveries makes inaccessible a large amount of data that would allow a better understanding of metal hoarding practices.

A Systematic Field Survey Programme

This is why the excavations and the study of the hillfort of the Camp du Château (Piningre and others 2004) were extended, since the beginning of the 2000s, by a systematic metal-detecting field survey programme in order to search for metal hoards in the surroundings. This programme is carried out in a legal and formal framework. Indeed, in France, one can legally search for archaeological heritage goods with a metal detector only under specific conditions clearly defined by the legislation: the surveyor must obtain a nominative authorization from the landowner, then submit an argued request for authorization that is carefully examined by the Territorial Commission for Archaeological Research. Subsequently, the surveyor obtains an annual prefectural permit. Hervé Grut, Patrick Mosca, and Patrick Guillot conduct this metal-detector research as volunteer archaeologists, under the scientific supervision of Jean-François Piningre. Since 2018, the Regional Archaeological Service of Bourgogne — Franche-Comté and the 'Chrono-Environment' laboratory (CNRS) have been financing a collective research programme, coordinated by Estelle Gauthier. The research area covers a zone of 10 km around Salins-les-Bains, between Malans in the north-east, Mesnay in the south, and Marnoz in the west.

The protocol used includes GPS recording of the exact coordinates and the meticulous excavation of the finds. The intervention implies several stages: spotting of the objects, delimitation of the perimeter of the hoard, and finally, a fine excavation layer by layer. Tacheometer recordings allow the production of plans precisely inserted into the surrounding topographical context. Abundant documentation (photographs of the objects being excavated, drawings), as well as numerous field observations, complete the documentation of the discoveries (substrate, position of the bronzes in the ground, topographical context, remarkable natural elements in the immediate environment, possible anomalies of the ground). This protocol makes it possible to obtain high-quality information, usually inaccessible for accidentally found hoards.

The very precise location of the discoveries paves the way for questioning the choice of places and burying modes, which are apprehended through the position of objects in plan and stratigraphy as well as through their topographical and immediate environmental context. This information provides the opportunity to gain a concrete understanding of the practices involved in burying the metal objects.

The detailed study of the compositions of the hoards makes it possible to understand the selection of the objects: Which functional categories are chosen, in what proportion, are there repeating patterns in the selections, or are there any typical compositions? Furthermore, the detailed typological study of the bronze objects offers a cultural contextualization and a consolidated chronology of the phenomenon, rarely equalled in a micro-regional framework (Piningre and Ganard 2017, with further bibliography). Finally, the objects are carefully measured (mass, length), allowing statistical studies in order to search for standards in the deliberate fragmentation of the hoarded pieces.

After twenty years of collection, enough data have been accumulated, allowing us to deliver the first results.

The Contributions of a Systematic Survey

Quantitative and Chronological Contributions

Seventy-four new hoards have been found in the vicinity of Salins in the framework of the systematic field survey programme, which is ten times more than the fortuitous discoveries made in the preceding century and a half. The contribution of metal detectors allows not only extensive but also relatively targeted research. Of course, it does not only reveal Bronze Age objects, but prospectors can identify the characteristics of bronze hoards by the sound emitted by the detector: differentiate between bronze and iron, assess the number of objects, their approximate size and depth. Apart from a few settlements and frequented passages dating from more recent periods (from the Iron Age to the modern period), most of the finds are Bronze Age hoards and isolated objects. This concentration of hoards is a rare phenomenon, which is undoubtedly related to the geographical location and topographical configuration of the sector of Salins.

For practical reasons (accessibility, preserved environment, authorizations), the investigations have mainly focused on wooded areas, mainly municipal forests and some private properties. The surface investigated covers nearly 10 per cent of the area concerned (i.e., 5000 ha out of 52,000 ha; Fig. 6.1). The hill of the Camp du Château and its immediate surroundings (the plateau of Pretin, in front; Mont Begon, behind) were almost systematically surveyed, but the investigations also focused further from the fortified site, on the sectors dominating the valley of the Furieuse and the town of Salins-les-Bains (Côte de Thésy, Bois Bovard). Recent searches have focused on the surroundings of Mont Poupet, which dominates the entire valley at 851 m above sea level (the lowest altitude in the sector is 283 m). Overall, the study area is fairly well covered,

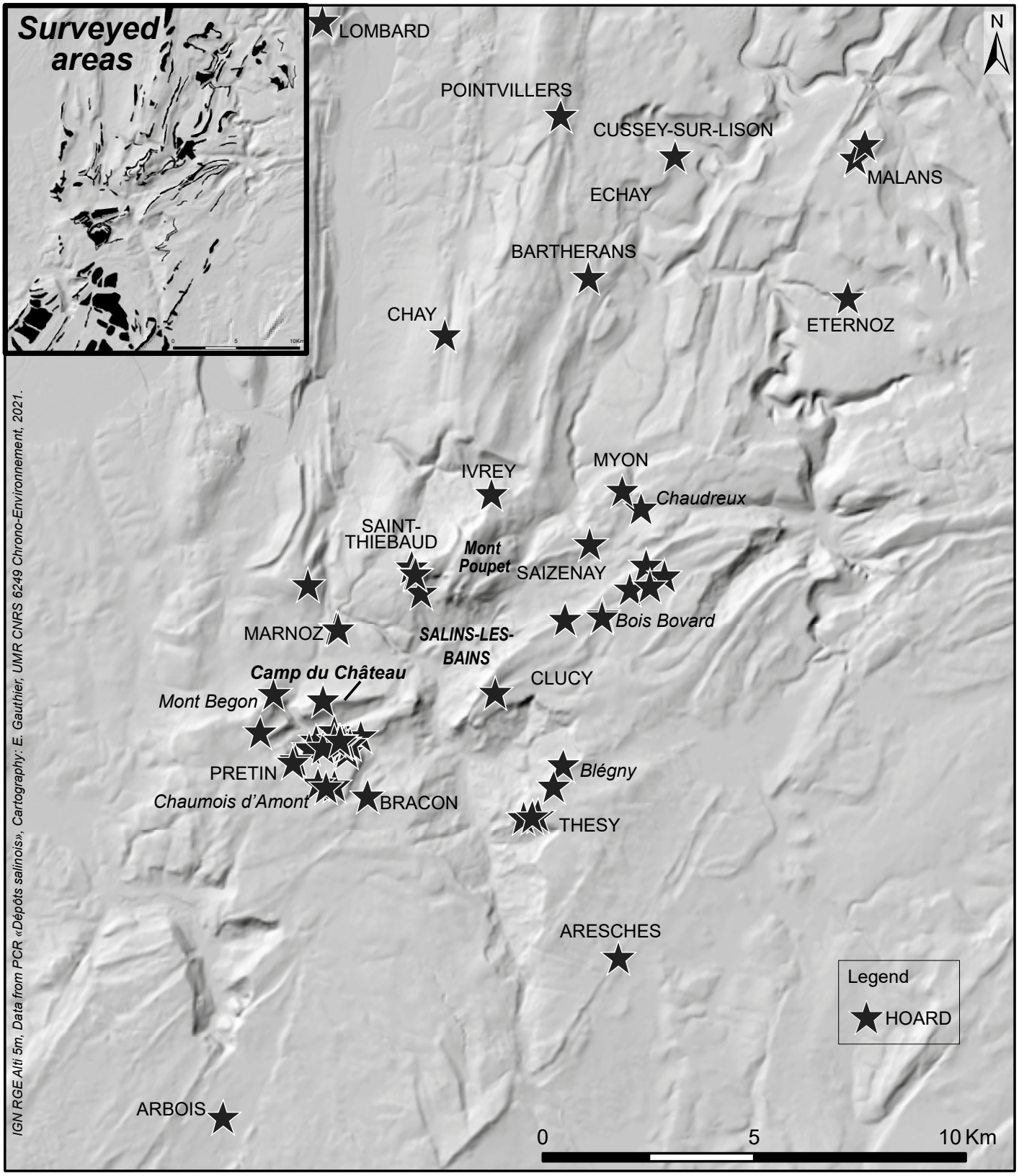


Figure 6.1. General map of the discoveries in the vicinity of Salins-les-Bains. Cartography: Estelle Gauthier.

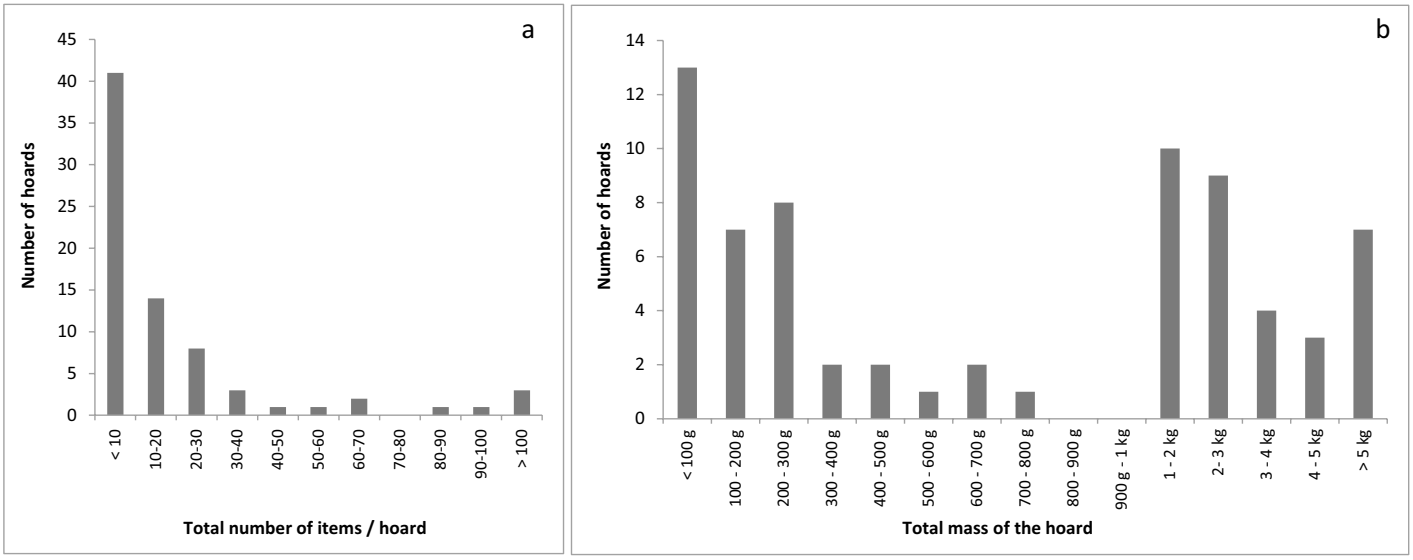


Figure 6.2. Composition of the hoards of the sector of Salins-les-Bains: a) total number of items per hoard; b) total mass hoarded. CAD: Estelle Gauthier.

but some contexts are less well represented, especially low-lying areas and the interior of some plateaus.

A hoard in the region of Salins contains between one and 618 artefacts. The vast majority are small sets of less than twenty pieces (Fig. 6.2a); only a few are larger hoards, but among them, there are three exceptional assemblages of more than hundred fragments (Chay, Pretin 12, Myon). In total, these discoveries represent some two thousand copper-alloy objects (and a few of gold). The mass of a hoard is very variable (Fig. 6.2b); two categories can be identified: very small assemblages of a few grams to a few hundred grams maximum (representing about 50 per cent of the hoards) and assemblages of more than 2 kg. Altogether, these discoveries represent more than 100 kg of hoarded metal found in the natural environment.

Twenty-eight hoards of ingot fragments, sometimes associated with non-characteristic object fragments, cannot be precisely dated. For the others, the detailed typological study allows a fairly precise chronological attribution (Fig. 6.3). One hoard is dated to the end of the Early Bronze Age and two others to the last phase of the Late Bronze Age (Ha B2–3). All the other sets are dated from the Middle Bronze Age and the first phase of the Late Bronze Age. More precisely, twenty-nine of them (39 per cent) belong to the Middle/Late Bronze transition (Bz C2 and D1) and ten to the end of the early Late Bronze Age (Bz D2/Ha A1).

This large number of finds now allows a re-examination of the insertion of the hoards into a micro-regional setting. Thanks to this representative documentation, with complete datasets, this programme has collected valuable information concerning the location, burial context, and composition of these assemblages.

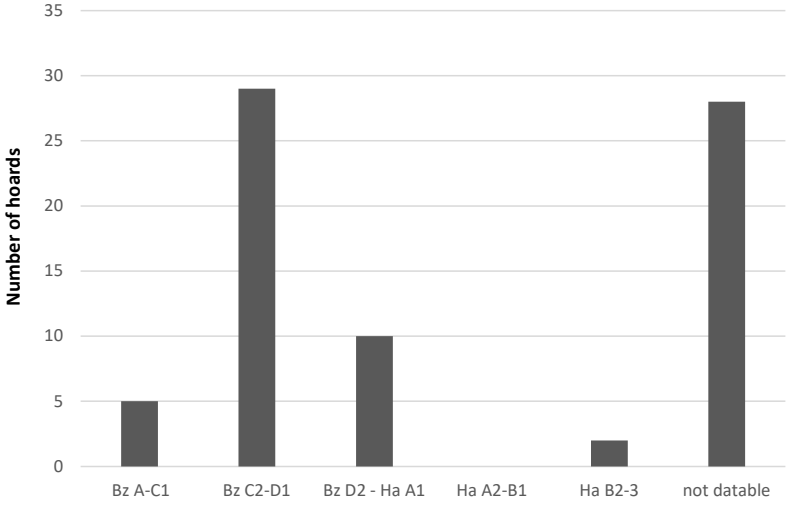


Figure 6.3. Dating of the hoards of Salins-les-Bains. CAD: Estelle Gauthier.

Qualitative Contributions

Composition of the Hoards

Concerning their compositions, the hoards of Salins appear to be relatively homogeneous. The vast majority are made up of fragments of ingots and foundry waste (the size and mass of which vary greatly, from only a few grams to almost 3.5 kg), often associated with entire or fragmentary axe-heads and sickles in small series. This typical assemblage is sometimes completed by some objects that one could qualify as 'personalizing' elements (one pin, one bracelet, one dagger fragment …). This composition is characteristic of the hoards dated to the end of the Middle Bronze Age and the transition

Figure 6.4. The hoard of Saizenay is representative of the hoards from the Middle/Late Bronze Age transition, composed of ingots and axe-head fragments. Photo: © David Vuillermoz, Musée de Lons-le-Saunier.

Figure 6.5. Hoard 12 from Pretin, dating from Bz D2/Ha A1, consists of 164 fragments belonging to a wide variety of functional categories. Photo: Jean-François Piningre.

to the Late Bronze Age (Bz C2-D1), as is the case for the hoard of Saizenay (Fig. 6.4).

By contrast, the hoards from Bz D2-Ha A1 are much more diversified but also contain more fragmented objects. The proportion of ingots is smaller (Piningre and Grut 2009; Piningre and others in press). This category includes the above-mentioned largest sets of over a hundred pieces (Chay, Cussey-sur-Lison, Myon, Pretin 12; Fig. 6.5). This change occurring in the composition of hoards between the late Middle Bronze Age and the end of the early Late Bronze Age should be understood as an evolution of codified practices.

These trends correspond fairly well to regional and/or chronological characteristics already observed for other finds. Sickles are known in several hoards from the end of the Middle Bronze Age or from the beginning of the Late Bronze Age in northern Burgundy and southern Champagne (Cannes-Ecluse, Longueville, Santenay, Villethierry). However, the particular frequency of sickles is also a 'speciality' of the Franche-Comté. In France, this region has, in fact, the greatest concentration of this tool. They are notably known in series in several large hoards, in particular from the French Jura (Larnaud, Briod, Beaujeu, Publy, Ray-sur-Saône, Tavaux). Generally, the hoards of the Middle/Late Bronze Age transition in eastern France are also mostly composed of ingots and axe-heads (e.g., Granges-sous-Grignon, Sermizelles, Teillet-Argenty, Verneuil), as is the case with the hoards of Salins. Overall, the objects hoarded in this phase are relatively heavier than in the next phase. Likewise, the Bz D/Ha A1 hoards in eastern France often present a great diversity of objects and a very strong fragmentation (Cannes-Ecluse, Publy).

It should also be noted that among the hoards of Salins, the Bz D/Ha A1 sets are the only ones to contain an abundance of jewellery, particularly women's accessories (bracelets, elements of belts, fragments of leg ornaments, pendants). This aspect contrasts clearly with the hoards from the Middle/Late Bronze Age transition, where women's accessories are rare. Several of them contain richly decorated bracelets (Chaumois d'Amont 1, Myon, Ivrey). Two long identical bronze pins, bent in the middle and placed parallel into the ground, constitute hoard 1 from Bois Bovard. Moreover, we also know prestige items: chariot wheel fragments (Myon) and fragments possibly belonging to metal vessels or defensive weapons. Hoard 6 from Pretin is composed of fragments of threads, ribbons, and rods, all made of gold (Piningre and Grut 2009, fig. 12).

Burying Conditions

Regarding how the objects were buried, the finds of Salins display other specificities. Most of these hoards were found very close to the surface, sometimes even outcropping. Their depth generally does not exceed 15 to 20 cm, so shallow that one wonders if the objects were really buried or if they were simply covered by the effect of natural sedimentation.

Another characteristic in the region of Salins is the important dispersion of the fragments. The scattering of some hoards is relatively limited (e.g., about 2 m² for hoard 16 from Pretin), but it happens

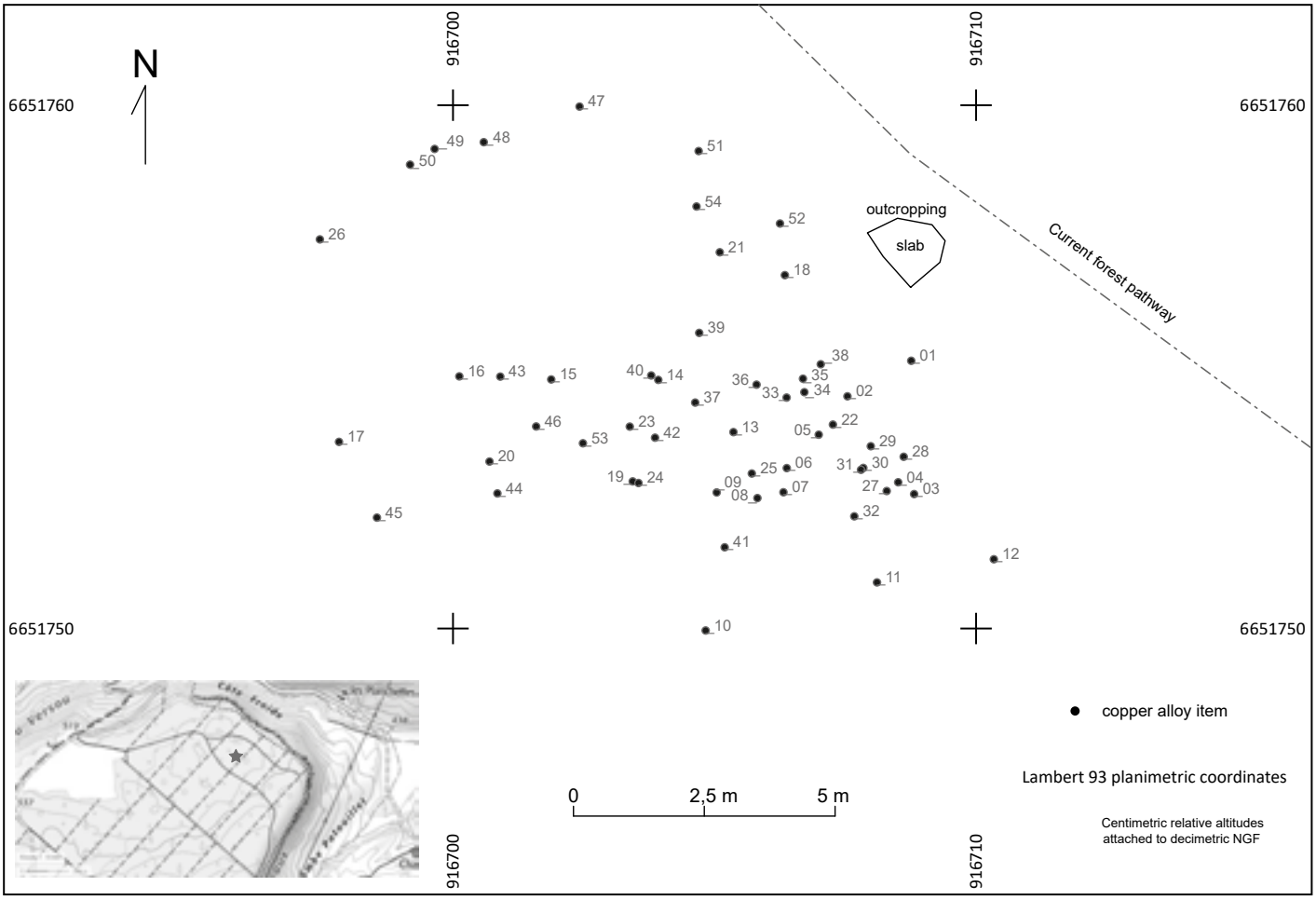


Figure 6.6. Plan of hoard 18 from Pretin: the fragments are scattered over a surface of approximately 75 m². CAD: Jean-Baptiste Caverne.

Figure 6.7. The hoard of Lombard was discovered inside a crack of a large rock. Photo: Jean-François Piningre.

Figure 6.8. The bronze objects of Chaumois d'Amont hoard 1 were grouped under a clay layer and a dense cover of flat stone slabs. Photo: Jean-François Piningre.

that some fragments are separated from the main group of objects and are dispersed over several metres. The area covered by other hoards is much more important (e.g., up to 75 m² for hoard 18 of Pretin, Fig. 6.6). This excludes the possibility that these hoards were confined in urns, in pits, or in deeply buried perishable containers.

Sometimes natural crevices in the bedrock have been used to contain the hoard. Thus, several cases of bronze objects hidden in a crack of a rock ledge are attested (Chaumois d'Amont 2, Saizenay, Lombard, Fig. 6.7). Others were found amidst clusters of karst pavement, which could constitute a natural enclave making it possible to circumscribe the hoard (Blégny, Bois Bovard 1, Droitfontaine, Pretin 1, Thésy 1, etc.).

Finally, in a few rare cases, particular care was paid to the positioning of the pieces in the ground. A clay layer and a dense cover of flat stone slabs sealed hoard 1 of Chaumois d'Amont (Fig. 6.8). Objects were sometimes positioned side by side or superposed: the two pins of the Bois Bovard hoard 1 were placed in parallel; the axe-head and the chisel of Granges-Feuillet hoard 2 were superimposed, as well as four objects in the Bois Bovard hoard 2 and the spearhead and the axe-head of the hoard of Côte Château. In larger sets, groups can sometimes be observed, especially groupings of bracelets (Chaumois d'Amont 1, Ivrey).

We cannot doubt that these objects were arranged intentionally in this manner. This is why we can wonder if the dispersion of the objects and their shallow depth observed for the majority of hoards could also be intentional. The displacement of objects by the action of natural and/or anthropogenic erosion constitutes a plausible explanation in contexts of limestone plateaus with thin sediment cover. According to this hypothesis, the objects could have been initially grouped but probably buried at a shallow depth just at the edge of the plateau. The size variation of the fragments tends to prove this kind of displacement along the slopes. For example, in the case of the hoard of Myon, the heaviest objects appear at the base of the slope, while the smallest and lightest are more numerous towards the top. This explains not only the dispersion of the fragments but also the fact that no organization of the objects can be detected in the majority of cases.

Thus, some of the slope finds could have been originally positioned on the edge of the escarpment and then slipped down. But other examples clearly seem to have been positioned initially on a slope (Ivrey). The case of hoard 18 from Pretin is even more

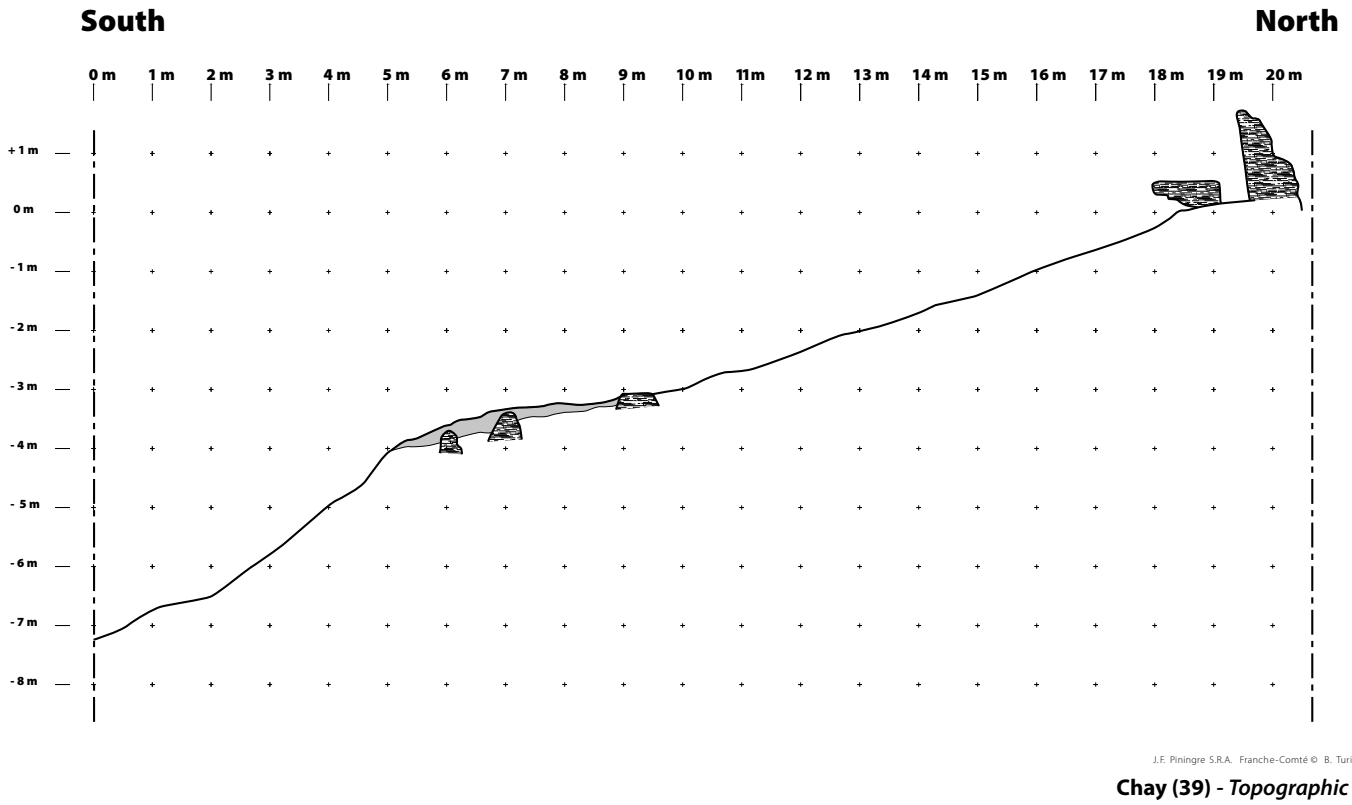


Figure 6.9. Topographic profile of the hoard of Chay: the main cluster of objects (probably corresponding to the original position of the hoard) is located in the middle of the slope, at some distance from the large blocks at the edge of the sinkhole. CAD: Jean-François Piningre and Bertrand Turina.

surprising: it is one of the most dispersed hoards (it covered approximately 75 m²); nevertheless, it was on a flat surface. The spread of the objects cannot be explained by their natural displacement according to gravity or natural erosion. Chaumois d'Amont hoard 3 is located on a surface with a slight slope. However, this slope is not steep enough to explain the wide dispersion over some 20 m². These observations may attest to the practice of an initially shallow burial, the superficial dispersion of the objects at the time of their 'abandonment', or even an above-ground deposition (in a tree trunk, for example, or associated with a perishable construction?).

It is still difficult to make a distinction between the taphonomic hazards (erosion, sliding objects on slopes) and the actions performed at the time of hoarding (deliberate dispersion of objects, throwing or progressive deposition of objects?) that could explain the distribution of fragments over several square metres. In any case, these burying conditions lead us to question the status of the hoarding places, protected, not physically but socially, or the existence of above-ground natural or man-made structures that have now disappeared, such as a tree trunk or a construction made of organic material.

The Context and the Immediate Environment of the Hoard

The hoards of Salins were placed in very specific topographical contexts. Most of them are in a dominant position (on the edge of a plateau, on a ridge, on the talus of a scree of a limestone ledge, which characterizes the *Abhangdepotfund* type according to the classification of Soroceanu (1995, 23 and fig. 3).

One of the main topographic situations in the region of Salins is characterized by the choice of the edge of a plateau very close to the slope break. This position offers a strategic point of view onto the valley below or onto a pathway. The hoard of Chaudreux, on the top of a small rocky spur overlooking the Lanquetine gorge, a pathway probably of very ancient origin, is a good example of this type of configuration, like a dozen other sites. Hoard 20 from Pretin dominates a valley giving access to the plateau of Pretin and has a direct view of the Camp du Château. The hoards found on the edge of a sinkhole can also be compared to the previous ones (Chaumois d'Amont 2, Lombard, Malans 2 and 3), as they are clearly associated with rocky escarpments on the edge of the depression. Like the hoards in a high position, they were originally grouped at the level of

Figure 6.10. Hoard 15 from Pretin was buried at the foot of large stone blocks, standing out clearly in the landscape. Photo: Jean-François Piningre.

the escarpment but they slid down along the slope due to erosion.

Finally, the most original category consists of hoards found on a steep slope, dominated by a rocky spur, but whose original position cannot be directly connected to the spur itself. Indeed, the hoards of Chay, Myon, and Ivrey differ from the previous model insofar as the cluster of objects that could constitute the original location of the hoard is located at some distance from the escarpment, in the middle of the slope (Fig. 6.9). This makes improbable the hypothesis of an initial burying on the top of the cliff which would have collapsed afterwards. It would therefore be necessary to admit that these hoards were indeed made in the middle of the slope and at a very shallow depth (or not buried at all?).

In this case, the rocky spur located higher up may form a natural landmark clearly visible in the landscape. Hoards in the middle of a slope are not the only ones to benefit from such landmarks. Indeed, a large number of observations were also made for hoards at the edge of an escarpment. Some were immediately at the foot of one or more large boulder(s), standing out clearly in the landscape (Fig. 6.10). The hoards located in the middle of blocks of karst pavement are also very easily located in the landscape.

The link or proximity to clearly visible natural topographic features is almost constant: rocky escarpments detached from the cliff, limestone ledges, rocky promontories, karst pavement rocks, but also the use of cracks between large rocks to place the objects inside, etc. All these natural elements, which stand out clearly in the landscape (especially since it was undoubtedly less wooded than today, Richard and Gauthier 2007), could have served as natural landmarks. It is easy to find the location of the hoard or to be able to spot it from afar in the panorama.

The specificity of the topographical choices observed in the context of Salins sheds new light on the practice of hoarding. Their repetition suggests that topography was an important criterion in the selection of hoarding places and suggests particular strategies for implantation within the Bronze Age cultural landscape.

Spatial Contributions

The position of hoards has become a focus of research quite recently. Until the end of the 1990s, the spatial approaches proved to be relevant only on a regional scale because the documentation was most often based on fortuitous and isolated discoveries (Briard 1998; Mordant 1998; Piningre 1998). However, a few exceptions have already shown, thanks to geophysical surveys, the grouping of several hoards, sometimes diachronic, in particular in Normandy, Brittany (Saint-Igeaux and others 2002; 2005), Austria (Rabenwand and Windholz-Konrad 2005), or Germany (Bullenheimer Berg and others 2012). The choice of the location of hoards, in the same way as their composition, no longer seems to be fortuitous. An exploratory approach has been carried out for the sector of Salins in order to study the location of hoards in the landscape and their links with their topographic environment.

On the scale of the study area, the hoards form two groups centred on two entrance routes into the Jura Massif by two tributaries of the Loue River: the valleys of the Furieuse to the south and that of the Lison to the north (see Fig. 6.1). However, it is in the area near the Camp du Château and Mont Poupet where most of the hoards were discovered. At first sight, four main groups can be distinguished in which the majority of hoards are concentrated over a couple of hundred metres. The most important of these groups is located in the vicinity of Pretin. This group consists of nineteen hoards along the edge of the plateau, another below it, and three others further inland. The plateau of Pretin occupies a privileged place where the proximity of the Camp du Château, visible 1 km to the north, seems to be decisive.

Further south, a second group of five hoards borders the 'Reculée' of Salins and overlooks the course of the Furieuse along the edge of the Thésy plateau (Thésy 1 to 2, 'en Velet', Blégny). Eight other hoards occupy the oblong plateau of Bois Bovard, east of Salins-les-Bains, which dominates the Todeur. Finally, eight other hoards are distributed more widely all around Mont Poupet. One should also add the hoard allegedly found at the

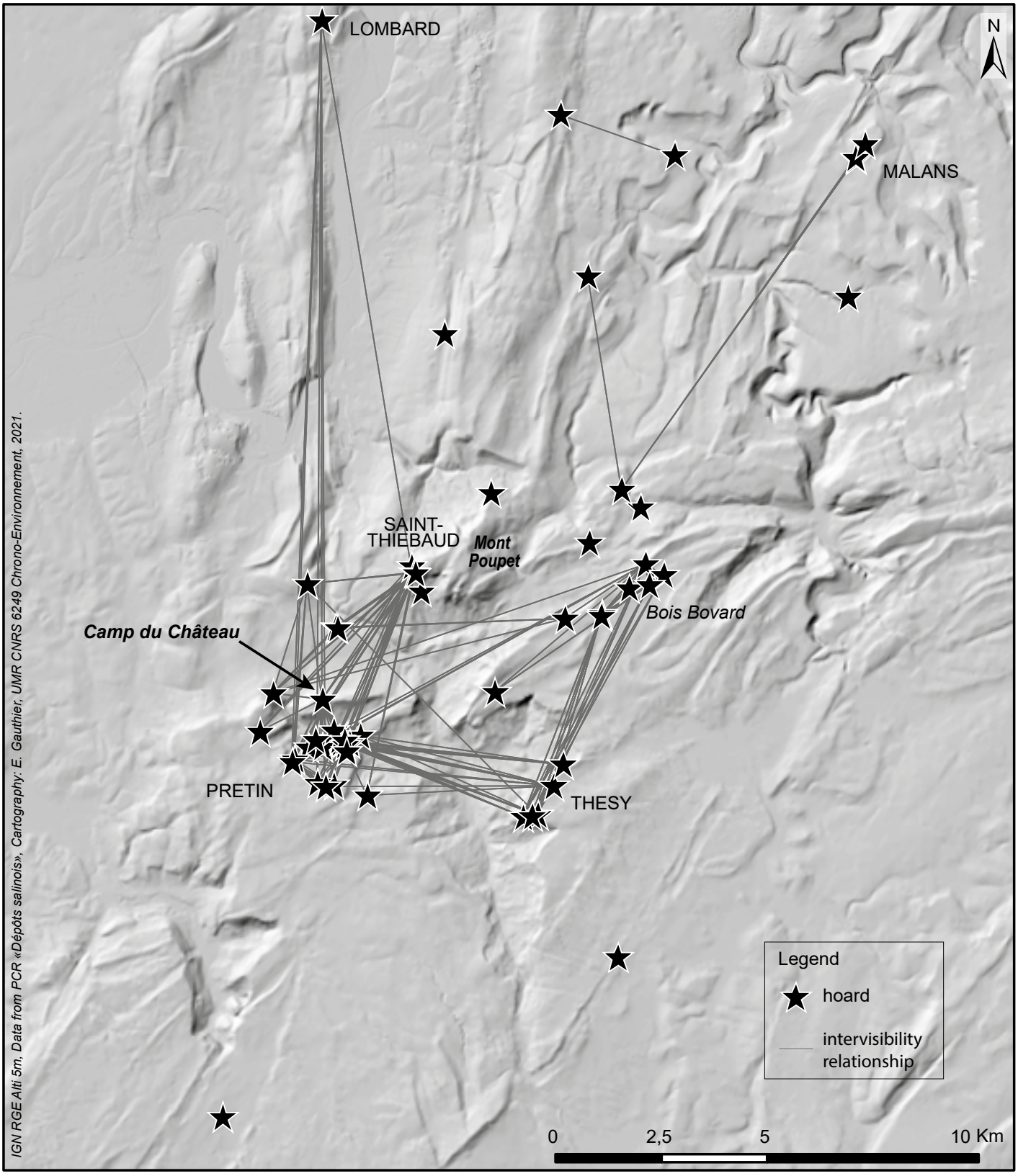


Figure 6.11. The visual relationships between the hoarding places correspond to an 'intervisibility web' covering the central sector around the Camp du Château and Mont Poupet. GIS & cartography: Estelle Gauthier.

top of Mont Poupet in the nineteenth century and another at its southern foot.

By contrast, we notice the rarity of finds near the hillfort. This phenomenon seems to correspond to a deliberate choice of the population of the Middle/Late Bronze Age transition: the hoards clearly did not have to be placed immediately near the settlement but on the heights dominating the surroundings.

Each of these concentrations correlates with determining zones of the landscape emphasizing the contact between the valley and the plateau. The almost systematic choice of dominant positions leads us to examine the visibility from and towards the places of hoards.

Visibility analyses are quite commonly used to study the visual influence of hillforts or funerary monuments (Lake and Woodman 2003), places that are obviously made to be seen. However, this is not the case with hoards, which by definition were buried. But recent studies have revealed that their location fits into the anthropomorphized landscape (see in particular Fontijn 2002; Hansen and others 2012). Indeed, for the community that made the hoard, the chosen location could be as significant (or more) as the buried objects. Even if the emplacements of hoards were not marked on the ground, collective memory could undoubtedly preserve the information on their location and perhaps even pass it on for several generations (Rowlands 1993; Fontijn 2007). However, sight plays a role in supporting memory. Being able to designate a place in the distance makes it easier to communicate its position. It thus helps to maintain traditions and the social imaginary (Gauthier and Piningre 2016). In this case, seeing the place precisely is not as important as being able to discern it far away or imagine it mentally. In addition, the almost systematic proximity to natural landmarks, clearly visible in the landscape, helps to locate them more easily from a distance.

Moreover, the topography of the region of Salins offers beautiful panoramas in which it is easy to choose places that are clearly visible or, on the contrary, hidden, or places from which one can see some important points in the landscape. The particular contexts of the burial of the hoards (lines of ridges, breaks in slopes, edges of terraces, etc.) suggest that topography was an important criterion in the choice of hoarding places. Did their visibility also matter?

We therefore chose to test the visibility from and towards each of the places concerned, using a Geographic Information System. The method was developed in the 1990s (see in particular Fisher 1996; Wheatley and Gillings 2000; Llobera 2007). The DEM used is that of the IGN RGE Alti®,[1] with a resolution of 5 m. The study protocol consists in calculating the visibility zones of each site and in counting the visual relationships between sites (Gauthier and Piningre 2016).

The analysis allowed the identification of 292 visual relationships. These links highlight a strong intervisibility between the hoarding places. From the place of each hoard, it is generally possible to see three to seven other sites (Fig. 6.11). Some have much better visibility, in particular those of Pretin 13, Pretin 14, Saizenay, and Saint-Thiébaud 3, from where it is possible to see nearly fifteen other hoarding places. Moreover, this intervisibility concerns not only nearby hoards but also finds located in different sectors, particularly linking the group of the Bois Bovard to the group of Thésy and the group of Pretin to those of Marnoz, Saint-Thiébaud, and Thésy. The relationships highlighted between the groups are thus complementary, and they are established on both sides of Mont Poupet and the Camp du Château, to form a web of relationships covering the entire central sector. However, this 'intervisibility web' seems to concern only the central sector but not the more distant hoards.

We also observe very good visual relations with the Camp du Château and Mont Poupet, privileged, of course, by their dominant position giving them a large visual influence. Almost all the hoards in the central zone of the study area can be seen from both of these two points (Fig. 6.12).

This first approach thus makes it possible to propose the existence of an organized system of hoards in the centre of the studied area. This analysis could only be carried out thanks to the very good precision of the locations since the precise GPS coordinates of the finds were taken at the time of their discovery. The reliability of the coordinates taken under forest cover is checked on the IGN 1/25,000 map. The precision of the DEM can be considered sufficient for this analysis. Indeed, tests were carried out by moving the places of discovery within a radius of 5 m; the results are almost identical except that additional new visual links could be detected, but none of the previously identified links disappeared. We can therefore consider the result of the correlation analysis to be reliable.

The quality of the information collected thanks to a systematized approach and the very detailed and precise recording, provides a lot of new knowledge on the practice of hoarding in the region of Salins: about the selection of objects, the modes of burial (although many unknowns remain due to the high mobility of objects caused by the erosion), and the choice of hoarding places. These various observations lead us today to revise the interpretation of hoards and hoarding from new angles.

1 Digital meshed terrain model of the French relief, produced by the Institut national de l'information géographique et forestière (IGN).

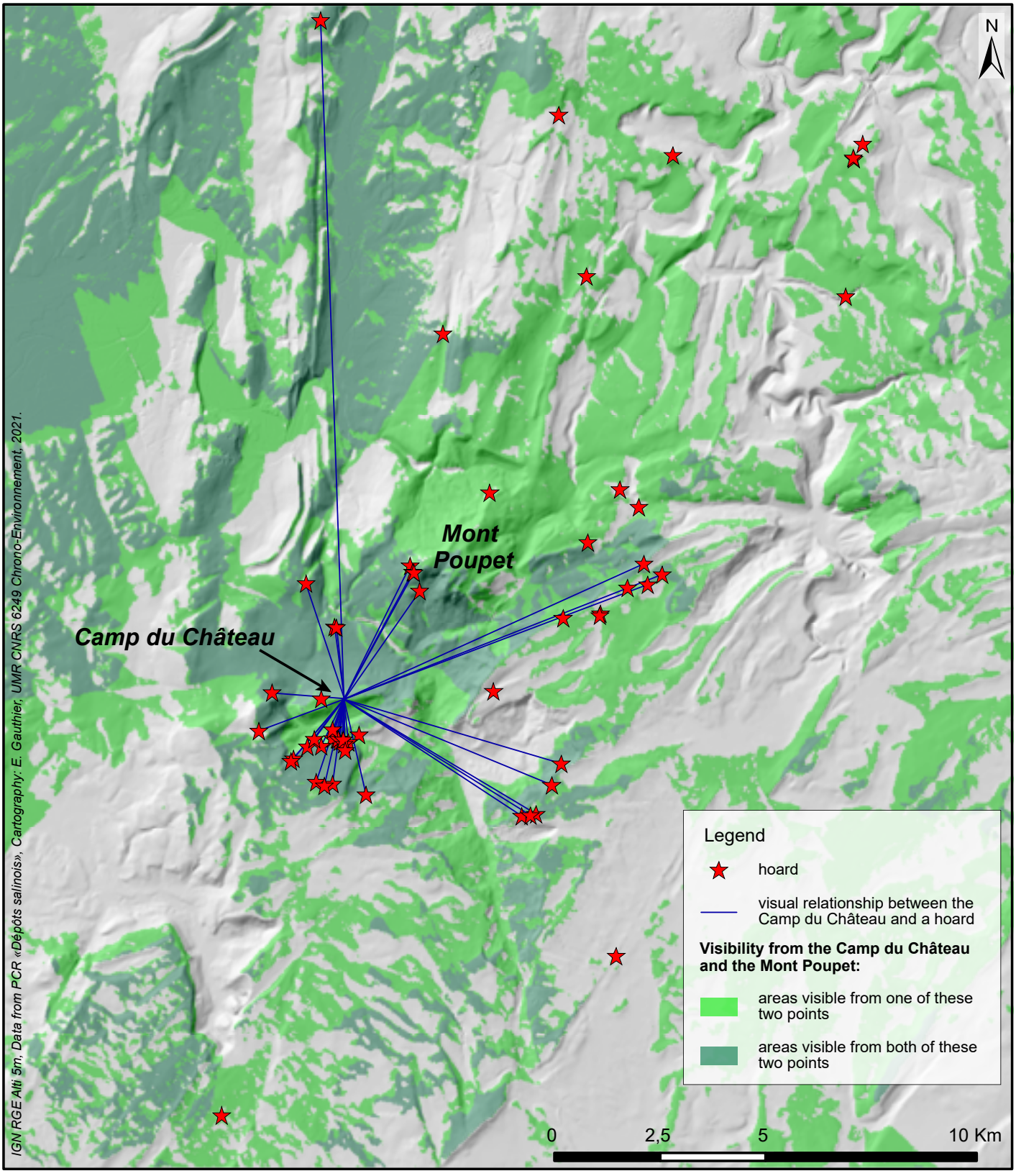

N
Mont Poupet
Camp du Château
Legend
hoard
visual relationship between the Camp du Château and a hoard
Visibility from the Camp du Château and the Mont Poupet:
areas visible from one of these two points
areas visible from both of these two points
0
2,5
5
10 Km
IGN RGE Alti 5m, Data from PCR «Dépôts salinois», Cartography: E. Gauthier, UMR CNRS 6249 Chrono-Environnement, 2021.

Figure 6.12. Visible areas from the Camp du Château and Mont Poupet: almost all the hoards of the central sector are visible from both of these two points. GIS & cartography: Estelle Gauthier.

Towards a New Interpretation of the Hoards Phenomenon

The Hoards of Salins Facing the 'Traditional' Interpretations

The traditional image of a hoard depicts a set of metal objects (at least two, but usually from a few dozen to several hundred) grouped together in a pit or sometimes in a vessel. The Villethierry hoard is a good example of such a dryland hoard (Mordant and others 1976). It is of very homogeneous composition (many items of jewellery from the same workshop), placed and buried in a pottery vessel. The burial depth of these deposits is variable but when this information is known, it generally reaches between 50 cm and 1 m depth on average (Gauthier 2017b). Objects submerged together in a lake or a river are also considered hoards. This is particularly the case with the cuirasses of Marmesse (Lehoërff 2008). The wet environment could then ensure the inaccessibility of the deposited objects. This is why hoards are generally considered to be closed units, buried only once and not retrieved.

Interpretations of hoards fall into two main categories: firstly, a very pragmatic vision sees the hoard as a hiding place of wealth in times of insecurity or else as an artisan's stock. The objects were therefore intended to be recovered one day but ultimately were not. The Villethierry hoard (see above) and the Briod hoard (with 265 sickles) would meet this objective. The hoard of Génelard, which is made up of all the belongings of a bronze-worker (hammers, anvil, preforms, tools used to decorate the objects, etc., Thevenot 1998), can also be classed as such. Finally, the large sets of fragments characteristic of the first stage of the Late Bronze Age (Bz D/Ha A1) could be stocks of raw material, made up of broken or old-fashioned objects that were intended to be remelted. This would explain the diversity of the pieces and their high rate of fragmentation. Finally, the series of axes and ingots, which are heavy objects, characteristic especially of the hoards of the end of the Middle Bronze Age, could also constitute stocks of raw material.

The second point of view concerns symbolism and religion: this would rather see the hoards as the result of ritualized acts of a religious or social nature. Like the dedications in sanctuaries, the buried objects would therefore be offerings to deities in consecrated places. The difference is that this type of place is very poorly known for the Bronze Age (lack of delimitation; no visible trace of construction or other space management, etc.), except in rare cases, such as Flag Fen (Coombs 1992) or Acy-Romance (Lambot 1989). One would expect the offerings to be rich, to represent a real sacrifice from the donors and a considerable loss to society. Bronze is precious by nature; large assemblages of complete objects in good condition could serve this purpose. There are also a few gold hoards (Rongères, Villeneuve-Saint-Vistre, Jaligny-sur-Besbre — Armbruster 2013). Symbolism can also be felt in the composition of assemblages: several hoards from the Late Bronze Age clearly represent personal equipment (Verger 1992; 1998; Gauthier 2017a; men's: e.g., Vénarey-les-Laumes, Vaudrevanges, or women's: e.g., Mathay, Blanot). Another example is the hoard from Evans consisting of a whole banquet service (vases for preparing, serving, and consuming alcoholic beverages, Piningre and others 2015).

Although the phenomenon of hoards is particularly frequent (and characteristic) for the European Bronze Age and common to the entire territory of Europe, it is not possible to favour one interpretation over another. Yet, we can question if all hoards had a common function. The hoards of Salins, by their number and the quality of the information collected, provide an opportunity to re-discuss arguments relating to their interpretation.

The main aspects of their composition, on the one hand, sets of ingots, axes, and sickles in series at the end of the Middle Bronze Age, and on the other hand, diversified and fragmented assemblages from the early Late Bronze Age, may suggest artisans' stocks. These hoards could actually correspond to raw material intended to be remelted in a standardized form in the first case, and in the form of waste stocks in the second case. This idea appears quite clearly from sets such as those of Saizenay (Fig. 6.4, Piningre 2017) or Pretin 12 (Fig. 6.5), which represent several kilograms of metal. This may also be the case with hoard 6 from Pretin consisting only of gold in the form of lamellae, rods, and bars (Piningre and Grut 2009, fig. 12). It could be a set of raw material belonging to a goldsmith. In this case, interpreting the hoard as a hiding place as well as an artisan's stock would be acceptable.

However, we can note that a large number of the hoards of Salins actually contain a very small quantity of bronze (see above, Fig. 6.2a and Fig. 6.13), and weigh only a few hundred grams in total. Are these 'treasures'? Can we qualify them as metalworkers' stocks? Considering the composition of these sets of a few tiny pieces, it is difficult to imagine that people have come to these remote and relatively inaccessible places only with the aim of hiding them or storing them temporarily. Why would a craftsman come there to gather such a small stock? Why would somebody 'hide' them in places so visible and identifiable, rather than out of sight?

Despite the general aspects of their composition, which fits into the trends observed at the regional level in eastern France, the other characteristics of the hoards of Salins do not correspond to the expected image of a hiding place, nor to that of the stock of a craftsman, nor

even to an offering with a strong social connotation. The assemblages cannot be associated with the idea of richness that one might want to hide or offer to deities.

However, it appears quite clearly that the notion of symbolism is undoubtedly involved in their constitution. These sets with very specific characteristics highlight a hoard type, which finds parallels in continental Europe (Windolz-Konrad 2002; 2005; 2010; Nomayo and Falkenstein 2012; Szabó 2016; Hansen and others 2016). It is obvious that this type of small hoard could rarely be spotted without systematic metal-detecting surveys.

A study of the length of the hoarded objects shows an intention to equalize their size, perhaps to correspond to a certain standard (Fig. 6.14a, b). Is this a way to reduce the size of the pieces to hide them more easily? In this case, why do only a tiny number of fragments belong to the same objects? If the objects were cut specifically to constitute a stock, pieces of the same object would have been very frequent. However, among the 2500 fragments present in the hoards of Salins, only about twenty are joining fragments. So, we have to face the fact that most of the metal needed for the production of so many objects has never been physically there.

It should be concluded that the fragments discovered were selected specifically for the hoard and that the rest was probably used in some other way. The phenomenon of hoards thus attests to the practice of recycling, not directly (material to be recycled as one usually considers), but indirectly (material that was not intended to be recycled). Thus, the object is intended to be represented by a fragment symbolizing the whole. We speak of the notion of *pars pro toto*. The fragment may represent the whole object, while the bronze is not entirely lost for the owner/community. In the case of an act of a religious nature, this can take on a very particular meaning, that of the sacrifice of a piece representing the entire object, offered in a symbolic way, while taking advantage of the 'economy' achieved by the reuse of the rest, which can be important in a context where the raw material is expensive and difficult to access.

The notions of 'value' and 'sacrifice' which are naturally associated with religious offerings, must therefore be relativized. Like the 'hecatombs' in the Greek world, only a part of the sacrificed animals was

Figure 6.13. Hoard 1 from Malans is representative of the very small hoards that constitute the majority of discoveries in the region of Salins. Photo: Jean-François Piningre.

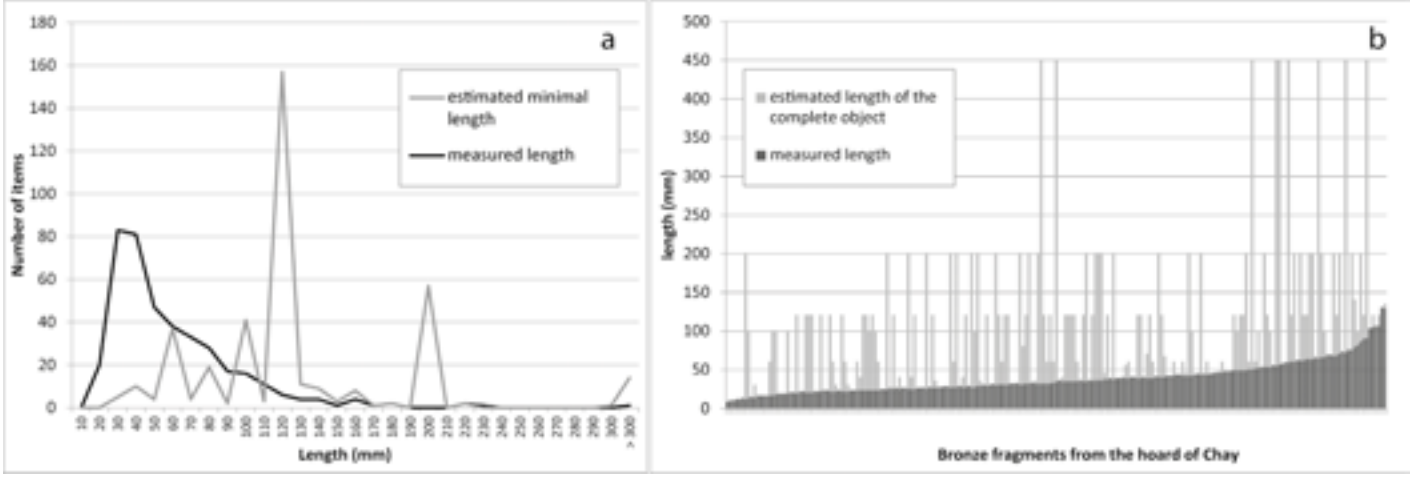


Figure 6.14. The length of the hoarded fragments seems to be standardized. a) Compared to the estimated length of the complete objects, the measured length of the hoarded pieces is concentrated at around 3–5 cm. b) The comparison of the length of the objects from the hoard of Chay to the estimated length of complete objects ('fragmentable' objects only: excluding foundry waste and very small objects) suggests a deliberate equalization of their length. CAD: Estelle Gauthier.

Figure 6.15. The pins of hoard 1 of Bois Bovard were found between two prominent blocks, both folded in half in the same way, then stuck vertically into the ground, in parallel, with the fold upwards. Photo: Jean-François Piningre.

offered to the deities while the rest was consumed (Jacquemin 2014). In addition, the symbolism linked to the *pars pro toto* makes it possible to see in the hoard an important expression of wealth if we consider all the objects sacrificed. Large and diversified hoards such as those of Chay, Pretin 12, and even more Myon symbolically contain dozens of swords, spearheads, daggers, bracelets, belts, etc. In the very small hoards constituted only by a few fragments of ingots, the symbolism is different but also present: it is, above all, the act of hoarding that must be considered rather than the amount of accumulated material.

The symbolic significance of the deliberate fragmentation of objects, necessary for the *pars pro toto*, is also accompanied by practices of degradation and mutilation of objects in the form of exaggerated twists or bends. These practices, which cannot be explained in a functional way, could participate in the sacrifice and the consecration of the objects. A good example is that of Bois Bovard hoard 1 which consists of two very beautiful and long pins, found between two prominent blocks, both folded in half in the same way, then stuck in the ground vertically, side by side, in parallel, the fold upwards, the head and the tip down (Fig. 6.15). The ritual aspect of such a burial method is undeniable. This is a real staging.

Hoards in their Environment

Now regarding the conditions of hoarding, the burial depth is generally too shallow to really speak of hiding places. The bedrock is also very close to the surface, as evidenced by the many karst pavement blocks in this landscape; these conditions are obviously not compatible with the desire to bury objects very deeply, following the 'classic' model of metal hiding places. This superficiality of the discoveries even raises the question of whether these objects were really buried. In the exceptional case of hoard 1 of Chaumois d'Amont, particular care was taken to protect the objects grouped under small stone slabs (Fig. 6.8). But for the other hoards, neither a pit nor any other structure/organization could be identified. Natural elements were used to provide relative protection for the hoarded items, but not necessarily in the earth: thus, in several cases, the objects were sunk into cracks in the rock or placed superficially among karst pavement blocks. It is also possible to consider structures or construction above ground level in wood or other perishable material.

The collapse of such structures (just like the collapse of the substrates on/in which the objects were placed) can explain the scattering of the finds of some hoards, however, as we have seen, the dispersion of the fragments seems deliberate in some other cases. This raises the question of the instantaneous nature of the hoards (Dietrich 2014). It is also possible to consider that they were not made all at once but, on the contrary, on multiple occasions, perhaps by several persons.

The observations made at Salins, therefore, support the hypothesis that hoards would be the result of symbolic and codified practices (evolving slightly over time but remaining basically the same between Bz B and Ha A2). The finds of the region of Salins thus do not meet the 'classic' model of a hoard as it is traditionally perceived. Similar ideas emerge for other new discoveries, such as the hoards from Rabenwand, Austria (Windholz-Konrad 2005), that present many similarities with the hoards of Salins, in terms of the topographical choices, the composition, or the staging of the objects.

Successive returns to the hoarding place would require keeping their location in memory. Sight plays an important role in spotting and serves to support

memory as well. Thus, the almost systematic presence of a natural element standing out in the immediate environment of the hoards would be a perfect signpost to remember the hoarding places and find them easily. This is especially true when they occupy a position already clearly visible in the landscape, as is the case with the hoards of Salins.

Marking the Landscape/Marking the Territory

Thus, although invisible, the hoards probably populated the landscape in the collective imagination of Bronze Age people. The importance of the visual link between the hoarding places and the different elements of the social landscape — the contemporary hillfort in particular — then becomes much more obvious. The possibility of seeing their location made it possible to keep the memory of these places alive and to integrate them into the daily landscape; their visual 'presence' thus helps to maintain the traditions.

For a practice established over the long term and widely implanted in the surrounding territory, it then becomes interesting to position the hoards taking into account the location of the previous ones. They allow the landscape to be marked out. Thus, when making a new hoard, visual contact with other sites could allow a more global consideration of the social or religious space. Such interpretations have already been proposed for Bronze Age peak sanctuaries in Crete, in another cultural setting, but in a fairly similar topographical context (Peatfield 1983; 1994; Briault 2007, 135). Intervisibility might have played an important role in the management of the religious and political landscape (Soetens and others 2002). The perception of the old hoarding places could indeed serve to commemorate past activities, and these places might have become visual milestones for the participants of these practices.

This hypothesis agrees very well with the spatial distribution of the hoards of Salins and with the intervisibility network that we have highlighted, forming a veritable web of visual relationships surrounding the hillfort. Taking advantage of the particular topography of this region, the Bronze Age communities might thus have chosen the places serving as a framework for their hoarding practices, taking into account their visual potential. The hoarding places have, in fact, been defined in such a way that it was possible to exercise visual control of almost all hoarding places from the Camp du Château (see above, Fig. 6.12; Gauthier and Piningre 2016; 2017). The proximity of natural landmarks standing out in the landscape further reinforces this idea by making it easier to spot the hoarding place when trying to see it from afar.

The Camp du Château could have thus been the hub of the network of hoards gradually established all around it. As in the case of the hoards in the region of Salins-les-Bains, the topographical choices but also the position of hoards *vis-à-vis* major circulation axes or the exploitation of resources (especially salt outcrops) are factors that have already been observed elsewhere (e.g., Windholz-Konrad 2002; 2005; 2010; Soroceanu 2012; Dietrich 2013). Several cases of associations of hoards with fortified hilltop settlements are known; the example of Bullenheimer Berg is one of the most representative (Diemer 1995). The systematic field surveys carried out around Hallstatt, in Styrie (Windholz-Konrad 2010) and around the hilltop settlements in the Transdanubia (Szabó 2009; 2016) confirm this close link as well.

The network of hoards associated with the Camp du Château has clear spatial boundaries. Indeed, some hoards visibly deviate from this model and seem completely outside this canvas. This is the case with the hoard from Aresches, the visibility area of which is entirely turned, towards the high Jura chain in the south, that is to say, in the opposite direction to the area of Salins-les-Bains. With the hoards found north of the Camp du Château and Mont Poupet (Malans, Bartherans, Chay, Cussey, Eternoz, Ivrey, Myon), there is almost no visibility relationship. These finds, therefore, do not seem to participate in the phenomenon observed in the sector of Salins. They were probably established according to a completely different model, perhaps in connection with another hillfort, such as that of Echay (this hypothesis has to be tested).

The system of hoards linked to the Camp du Château may thus operate in an area limited to about 10 km in diameter, mainly in a southerly, easterly, and northerly direction (Fig. 6.12). Indeed, the research carried out at Mont Begon located just in front of the Camp du Château, immediately to the west of it, has so far yielded nothing. The network thus has a rather oblong shape, limited by Mont Poupet and the Bois du Versou to the east, the end of the Pretin plateau and the Thésy plateau to the south.

One can also notice the absence of hoards from the Middle/Late Bronze Age transition in the immediate vicinity of the Camp du Château. The nearest known hoard is located nearly 800 m away, and, on average, the other hoards of the network are located 3 km (8 km maximum) from the hillfort. The hoards seem to have been placed at the limits of the visible area, relatively far from the Camp du Château, beyond the deep valley of the Furieuse. Separated from settlements and cemeteries, they could then be considered significant markers of the landscape, bordering the main routes of entry into the central-western Jura between the Saône plains and the Swiss plateau.

In addition, one can also notice that the position of the finds is most often at the limit of the visibility (that of hilltops as well as that of hoards). Instead of being in the centre of the visible areas, the hoards are

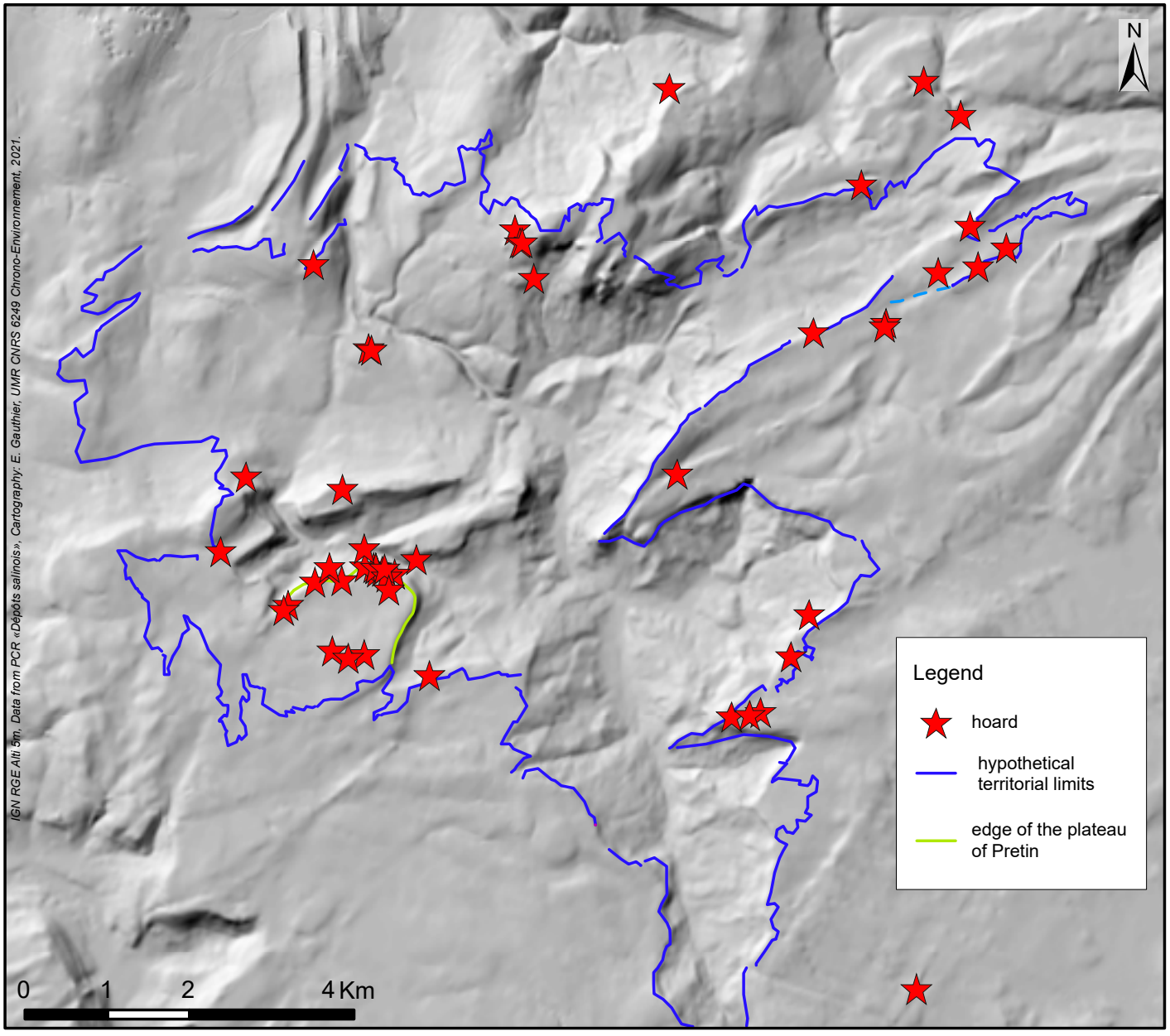


Figure 6.16. Hypothetical model of the territory controlled by the hillfort of the Camp du Château during the Middle Bronze Age and the beginning of the Late Bronze Age. GIS & CAD: Estelle Gauthier.

almost systematically in the first (or last) 5 per cent of the surfaces perceptible from the other hoards or the hilltops (Fig. 6.12). This phenomenon can, of course, be explained by the fact that the hoards are mainly placed on ridges and edges of terraces. The hoarding places have been defined in such a way that they materialize, in particular, the border of the surface visible from the Camp du Château (Gauthier 2017c; Gauthier and Piningre 2017). Moving forward, we can then hypothesize that the hoards might have marked out the limits of a territory that could be the social and/or religious space of the communities linked to the Camp du Château. Reconstructing the limits of this visually controlled area allows us to propose a model for the territory of the Camp du Château covering an area of approximately 5500 ha at the Middle/Late Bronze Age transition (Fig. 6.16). This example gives a concrete idea of the extent of a territory controlled by a hillfort in the Bronze Age.

Conclusion

The systematic metal-detecting field surveys carried out around the fortified site of Camp du Château

have considerably improved our knowledge of the bronze hoards phenomenon within a micro-region. They not only highlight the exceptional density of the hoards dispersed in an area of only 10 km in diameter but, thanks to detailed observations and very good documentation of the contexts of discovery, they also bring a lot to the knowledge of the practices of burying metal objects in nature. These observations have allowed us to revisit the interpretation of these practices. It appears that the hoards of the region of Salins do not correspond to the usual models and do not fit well into their 'classic' interpretations, such as craftsmen's stocks or hiding places. Their particular composition, the deliberate fragmentation of the objects, and the burial contexts put more emphasis on the symbolic character of these finds. Thus integrated into the landscape like so many symbolic signs, the hoards here seem to mark the limits of a social (perhaps also territorial) system established around a contemporary fortified hilltop settlement.

Works Cited

Armbruster, Barbara. 2013. 'Gold and Gold Working', in *The Oxford Handbook of the European Bronze Age*, ed. by Harry Fokkens and Anthony Harding (Oxford: Oxford University Press), pp. 450–64

Bradley, Richard. 1990. *The Passage of Arms: An Archaeological Analysis of Prehistoric Hoards and Votive Deposits* (Cambridge: Cambridge University Press)

Briard, Jacques. 1998. 'Répartition spatiale des dépôts de l'âge du Bronze en Bretagne', in *L'Atelier du bronzier en Europe du XX^e^ au VIII^e^ siècle avant notre ère: actes du colloque international 'Bronze'96'*, III, ed. by Claude Mordant, Michel Pernot, and Valentin Rychner (Paris: Comité des travaux historiques et scientifiques), pp. 223–34

Briault, Camilla. 2007. 'Making Mountains out of Molehills in the Bronze Age Aegean: Visibility, Ritual Kits, and the Idea of a Peak Sanctuary', *World Archaeology*, 39.1: 122–41

Coombs, David. 1992. 'Flag Fen Platform and Fengate Power Station Post Alignment – The Metalwork', *Antiquity*, 66: 504–17

Coutil, Louis. 1914. 'La cachette de fondeur de Larnaud (Jura)', in *Actes du 9^e^ Congrès préhistorique de France*, ed. by Léon Coutil (Paris: Bureaux de la Société préhistorique française), pp. 451–69

Diemer, Georg. 1995. *Der Bullenheimer Berg und seine Stellung im Siedlungsgefüge der Urnenfelderkultur Main frankens*, Materialhefte zur bayerischen Vorgeschichte, 70 (Kallmünz: Lassleben)

Dietrich, Oliver. 2013. 'A Small Bronze Hoard from "Kronstadt-Galgenberg". A Contribution to the Understanding of Cultural Landscapes in Middle Bronze Age Southeastern Transylvania', *Satu Mare — Studiişi Comunicări*, 29.1: 167–80

——. 2014. 'Learning from "Scrap" about Late Bronze Age Hoarding Practices. A Biographical Approach to Individual Acts of Dedication in Large Metal Hoards', *European Journal of Archaeology*, 17.3: 468–86

Fisher, Peter F. 1996. 'Extending the Applicability of Viewsheds in Landscape Planning', *Photogrammetric Engineering & Remote Sensing*, 62.11: 1297–1302

Fontijn, David R. 2002. 'Sacrificial Landscapes: Cultural Biographies of Persons, Objects and "Natural" Places in the Bronze Age of the Southern Netherlands, *c.* 2300–600 BC', *Analecta praehistorica leidensia*, 33–34: 1–392

——. 2007. 'The Significance of "Invisible" Places', *World Archaeology*, 39.1: 70–83

Gauthier, Estelle. 2017a. 'Les différents types de dépôts: étude des assemblages', in *Bric-à-brac pour les dieux? Les dépôts d'objets métalliques à l'âge du Bronze*, ed. by Sylvie Jurietti (Lons-le-Saunier: Musée d'archéologie), pp. 56–63

——. 2017b. 'Lieux et modes de dépôt', in *Bric-à-brac pour les dieux? Les dépôts d'objets métalliques à l'âge du Bronze*, ed. by Sylvie Jurietti (Lons-le-Saunier: Musée d'archéologie), pp. 92–97

——. 2017c. 'Le cas de la région salinoise: un possible marquage territorial?', in *Bric-à-brac pour les dieux? Les dépôts d'objets métalliques à l'âge du Bronze*, ed. by Sylvie Jurietti (Lons-le-Saunier: Musée d'archéologie), pp. 99–102

Gauthier, Estelle, and Jean-François Piningre. 2016. 'Communication visuelle autour du Camp du Château à Salins-les-Bains (Jura, France): mise en évidence d'un réseau de relations visuelles à l'âge du Bronze', in *Langages et communication: actes du 139^e^ congrès des Sociétés historiques et scientifiques* (Paris: Comité des travaux historiques et scientifiques), pp. 128–45

——. 2017. 'Dépôts de bronzes et relations visuelles autour du Camp du Château à Salins-les-Bains (Jura, France) à la fin du Bronze moyen et au début du Bronze final', in *Le Bronze moyen et l'origine du Bronze final en Europe occidentale de la Méditerranée aux pays nordiques (XVII^e^-XIII^e^ s. av. J.-C.)*, ed. by Thibault Lachenal, Claude Mordant, Théophane Nicolas, and Cécile Veber, Monographies d'archéologie du Grand Est, 1 (Strasbourg: MAGE), pp. 903–14

Hansen, Svend. 1994. *Studien zur Metalldeponierungen während der äleteren Urnefelderzeitzwischen Rhônetal und Karpatenbecken*, Universitätforschungen zur prähistorischen Archäologie, 21 (Bonn: Habelt)

Hansen, Svend, Daniel Neumann, and Tilmann Vachta (eds). 2012. *Hort und Raum: Aktuelle Forschungen zu bronzezeitlichen Deponierungen in Mitteleuropa*, Topoi — Berlin Studies of the Ancient World, 10 (Berlin: De Gruyter)

——. (eds). 2016. *Raum, Gabe und Erinnerung: Wiehgaben und Heiligtümer in prähistorischen und antiken Gesellschaften*, Topoi — Berlin Studies of the Ancient World, 38 (Berlin: Topoi)

Jacquemin, Anne. 2014. 'Le sacrifice dans le monde grec et ses interprétations', *Archimède: archéologie et histoire ancienne*, 2014.1: 107–13

Kristiansen, Kristian. 2000. *Europe before History*, New Studies in Archaeology (Cambridge: Cambridge University Press)

Lake, Mark W., and Patricia E. Woodman. 2003. 'Visibility Studies in Archaeology: A Review and Case Study', *Environment and Planning B: Planning and Design*, 30.5: 689–707

Lambot, Bernard. 1989. 'Le Bronze final et le Premier Age du Fer sur le site d'Acy-Romance (Ardennes)', *Gallia préhistoire*, 31: 209–58

Lehoërff, Anne. 2008. 'Les cuirasses de Marmesse (Haute-Marne), un artisanat d'exception', *Antiquités nationales*, 39: 95–106

Llobera, Marcos. 2007. 'Reconstructing Visual Landscapes', *World Archaeology*, 39.1: 51–69

Menez, Yves, and Muriel Fily. 2002. 'Saint-Igeaux (22): Dépôts de l'âge du bronze et ferme antique de Kerboar, Côtesd'Armor, rapport de sondage' (unpublished report, Service régional de l'archéologie de Bretagne)

——. 2005. 'Saint-Igeaux (22): le site de Kerboar. Nouvelles découvertes, rapport de sondage dans le cadre de la prospection' (unpublished report, Service régional de l'archéologie de Bretagne)

Millotte, Jacques-Pierre. 1963. *Le Jura et les Plaines de Saône aux âges des métaux*, Annales littéraires de l'Université de Besançon, 59 (Paris: Les belles lettres)

Mordant, Claude. 1998. 'Dépôts de bronzes et territoires à l'Age du Bronze en Bourgogne (XVII^e^-IX^e^ siècle avant J.-C.)', in *L'Atelier du bronzier en Europe du XX^e^ au VIII^e^ siècle avant notre ère: actes du colloque international 'Bronze'96'*, III, ed. by Claude Mordant, Michel Pernot, and Valentin Rychner (Paris: Comité des travaux historiques et scientifiques), pp. 185–210

Mordant, Claude, Daniel Mordant, Jean-Yves Prampart, Jean Bourhis, Jacques Briard, and Jean-Pierre Mohen. 1976. *Le dépôt de bronze de Villethierry (Yonne)*, Gallia préhistoire, supplément, 9 (Paris: Centre national de la recherche scientifique)

Nomayo, Stephanie, and Frank Falkenstein (eds). 2012. *Der Bullenheimer Berg im Fokus moderner Methoden der Archäologie*, Schriftenreihe des Städtischen Museums Kitzingen, 5 (Kitzingen: Sauerbrey)

Peatfield, Alan. 1983. 'The Topography of Minoan Peak Sanctuaries', *The Annual of the British School at Athens*, 78: 273–79

——. 1994. 'After the "Big-Bang" — What? or Minoan Symbols and Shrines beyond Palatial Collapse', in *Placing the Gods: Sanctuaries and Sacred Spaces in Ancient Greece*, ed. by Suzan E. Alcock and Robin Osborne (Oxford: Clarendon), pp. 2–36

Piningre, Jean-François. 1998. 'Les dépôts de Franche-Comté: analyse spatiale', in *L'Atelier du bronzier en Europe du XX^e^ au VIII^e^ siècle avant notre ère: actes du colloque international 'Bronze'96'*, III, ed. by Claude Mordant, Michel Pernot, and Valentin Rychner (Paris: Comité des travaux historiques et scientifiques), pp. 211–22

——. 2017. 'Le dépôt de Saizenay', in *Bric-à-brac pour les dieux? Les dépôts d'objets métalliques à l'âge du Bronze*, ed. by Sylvie Jurietti (Lons-le-Saunier: Musée d'archéologie), p. 103

Piningre, Jean-François, Maréva Gabillot, Claude Mordant, and Stefan Wirth. 2023. 'Regards inédits sur le dépôt de Larnaud dans le contexte des nouveaux dépôts découverts dans le Jura français', *Antiquités nationales*, 53: 80–99

Piningre, Jean-François, and Véronique Ganard. 2017. 'Le Bronze moyen et le début du Bronze final dans le Jura et la plaine de la Saône', in *Le Bronze moyen et l'origine du Bronze final en Europe occidentale de la Méditerranée aux pays nordiques (XVII^e^-XIII^e^ s. av. J.-C.)*, ed. by Thibault Lachenal, Claude Mordant, Théophane Nicolas, and Cécile Veber, Monographies d'archéologie du Grand Est, 1 (Strasbourg: MAGE), pp. 157–91

Piningre, Jean-François, Véronique Ganard, Philippe Barral, and Eric Boës. 2004. *Les nécropoles des âges du Bronze et du Fer de la Forêt des Moidons et le site princier du Camp du Château à Salins (Jura): les fouilles récentes et la collection du Musée des Antiquités nationales* (Paris: Comité des travaux historiques et scientifiques)

Piningre, Jean-François, and Hervé Grut. 2009. 'Dépôts et lieux de déposition de bronzes dans la région salinoise (Jura) au XV^e^-XIV^e^ siècle av. J.-C.', in *L'isthm européen Rhin-Saône-Rhône dans la Protohistoire: approches nouvelles en hommage à Jacques-Pierre Millotte*, ed. by Annick Richard, Philippe Barral, and Alain Daubigney, Annales littéraires de l'Université de Besançon, 860 (Besançon: Presses universitaires de Franche-Comté), pp. 183–99

Piningre, Jean-François, Michel Pernot, and Véronique Ganard. 2015. *Le dépôt d'Évans (Jura) et les dépôts de vaisselle de bronze en France au Bronze final*, Supplément à la Revue archéologique de l'Est, 37 (Dijon: Société archéologique de l'Est)

Richard, Hervé, and Emilie Gauthier. 2007. 'Bilan des données polliniques concernant l'Âge du Bronze dans le Jura et le nord des Alpes', in *Environnements et cultures à l'âge du Bronze en Europe occidentale*, ed. by Hervé Richard, Michel Magny, and Claude Mordant, Documents préhistoriques, 21 (Paris: Comité des travaux historiques et scientifiques), pp. 71–88

Rowlands, Michael. 1993. 'The Role of Memory in the Transmission of Culture', *World Archaeology*, 25.2: 141–51

Soetens, Steven, Jan Driessen, Apostolos Sarris, and Sophia Topouzi. 2002. 'The Minoan Peak Sanctuary Landscape through a GIS', *Archeologia e calcolatori*, 13: 161–70

Soroceanu, Tudor. 1995. 'Die Fundumstände bronzezeitlicher Deponierungen – Ein Beitrag zur Hortdeutung beiderseits der Karpaten', in *Bronzefundeaus Rumänien*, ed. by Tudor Soroceanu, Prähistorische Archäologie in Südosteuropa, 10 (Berlin: Spiess), pp. 15–80

——. 2012. 'Die Fundplätze bronzezeitlicher Horte im heutigen Rumänien', in *Hort und Raum: Aktuelle Forschungen zu bronzezeitlichen Deponierungen in Mitteleuropa*, ed. by Svend Hansen, Daniel Neumann, and Tilmann Vachta, Topoi — Berlin Studies of the Ancient World, 10 (Berlin: De Gruyter), pp. 227–55

Thevenot, Jean-Paul. 1998. 'Un outillage de bronzier: le dépôt de La Petite Laugère, à Génelard (Saône-et-Loire)', in *L'Atelier du bronzier en Europe du XX^e^ au VIII^e^ siècle avant notre ère: actes du colloque international 'Bronze'96'*, II, ed. by Claude Mordant, Michel Pernot, and Valentin Rychner (Paris: Comité des travaux historiques et scientifiques), pp. 123–44

V. Szabó, Gábor. 2009. 'Kincsek a fold alatt. Elrejtett bronzkori fémek nyomában', in *Régészeti dimenziók*, ed. by Alexandra Anders, Miklós Szabó, and Pál Raczky (Budapest: ELTE BTK Régészettudományi Intézet), pp. 123–38

——. 2016. 'Hortfunde und Siedlungen. Neue Faktenzum Kontext der spätbronzezeitlichen Deponierungen in Ungarn', in *Raum, Gabe und Erinnerung: Weihgaben und Heiligtümer in prähistorischen und antiken Gesellschaften*, ed. by Svend

Hansen, Daniel Neumann, and Tilmann Vachta, Topoi — Berlin Studies of the Ancient World, 38 (Berlin: Topoi), pp. 165–209

Verger, Stéphane. 1992. 'L'épée du guerrier et le stock de métal de la fin du Bronze ancien à l'Age du Fer', in *L'Age du Fer dans le Jura*, ed. by Gilbert Kaenel and Philippe Curdy, Cahiers d'archéologie romande, 57 (Lausanne: Bibliothèque historique vaudoise), pp. 135–51

——. 1998. 'Les trois âges de la dame de Blanot', in *L'Atelier du bronzier en Europe du XX^e^ au VIII^e^ siècle avant notre ère: actes du colloque international 'Bronze'96'*, III, ed. by Claude Mordant, Michel Pernot, and Valentin Rychner (Paris: Comité des travaux historiques et scientifiques), pp. 33–40

Wheatley, David, and Mark Gillings. 2000. 'Vision, Perception and GIS: Developing Enriched Approaches to the Study of Archaeological Visibility', in *Beyond the Map: Archaeology and Spatial Technologies*, ed. by Gary Lock, NATO Science Series, Series A, Life Sciences, 321 (Oxford: IOS), pp. 1–27

Windholz-Konrad, Maria. 2002. 'Ein späturnenfelderzeitlicher Depotfund von der Rettenwand in Kapfenberg, Steiermark', *Fundberichte aus Österreich*, 41: 407–26

——. 2005. 'Die Rabenwand – ein neuer prähistorischer Depotfund platz im Ausseerland, Steiermark', *Fundberichte aus Österreich*, 43: 289–349

——. 2010. 'Der prähistorische Depotfund vom Brandgraben im Kainischtal, Bad Aussee: mit einem Corpus der urnenfelderzeitlichen Mehrstückhortezwischen Öden- und Hallstättersee' (unpublished doctoral thesis, Institut für Archäologie, Karl-Franzens-Universität, Graz)

7. Ice-Marginal Valleys and Hoards

Natural Landscapes, Cultural Practices, and their Amazing Convergence in Different Regions of Central Europe (Poland)

▾ **ABSTRACT** Mobility is one of the hallmarks of the Bronze Age. This was formerly indicated mainly on the basis of the distribution of raw materials and artefacts (mainly metal ones), nowadays research on isotopes (e.g., the Egtved Girl) enables us to look at movement from the perspective of individuals and confirm its dynamics.

Already in the 1930s, routes were marked by connecting dozens of dots (which symbolized hoards of metal objects) on maps covering hundreds of thousands of square kilometres, this approach was practised for the next few decades.

Looking at the hoards of metal objects from a different perspective — by focusing on individual finds in the context of the natural landscape and other archaeological finds — provides us with the possibility of understanding how the deposition sites of metal artefacts shaped the Bronze Age routes and landscape.

Finds from Rosko and Karmin, which were deposited in a way that indicates that the deposition site was not accidental, are a good example. What is more, they were deposited in characteristic places — near the broad ice-marginal valleys that separate historical regions (Pomerania, Wielkopolska, and Silesia). Thanks to this, it will be possible to present the meaning of hoards in the landscape, as well as the way of understanding how the routes functioned in the Bronze Age. Their connection with clearly indicated physical boundaries, especially with places these were crossed, highlights the meaning of routes on the *mappa mundi* of the Bronze Age world.

▾ **KEYWORDS** landscape, hoards, Prehistoric routes, Bronze Age

Landscape archaeology, whose framework was established in the 1990s, has had a significant impact on archaeological research focused on various problems. Considerations on the meaning attributed to physical space by past societies, as well as research focused on its perception, very quickly gained a significant position among the topics addressed by archaeologists (e.g., Ucko and Layton 1999; David and Thomas 2008; Kołodziejczyk and Kwiatkowska-Kopka 2016).

Marcin Maciejewski • Institute of Archaeology, Maria Curie-Skłodowska University (marcin.maciejewski@umcs.pl)

Hoards from the European Bronze and Iron Ages: Current Research and New Perspectives, ed. by Marcin Maciejewski, János Gábor Tarbay, and Kamil Nowak, NAA, 4 (Turnhout, 2024), pp. 91–106.
BREPOLS PUBLISHERS DOI 10.1484/M.NAA-EB.5.142439

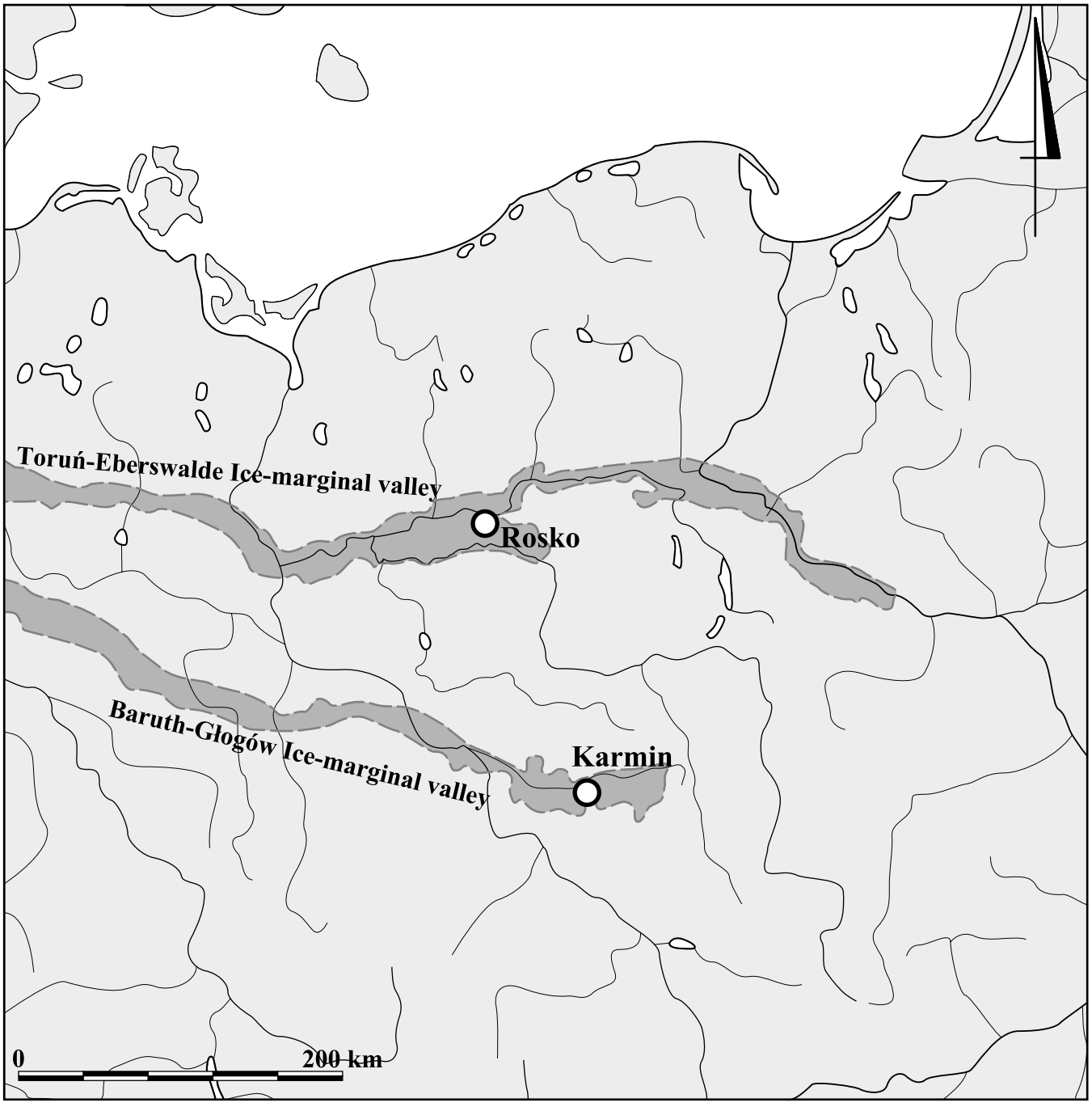


Figure 7.1. Map showing the location of Rosko, Karmin, and the Toruń–Eberswalde and Baruth–Głogów ice-marginal valleys. Map by the author.

The following decades brought a significant number of scholarly works with the word 'landscape'[1] in their titles and content, although they did not always refer to the paradigms of landscape archaeology. Also, in hoards research, various data began to be used to fit them into the context of the surrounding physical space. This is important as previously only a few studies took this type of information into account (in Polish archaeology, a very innovative paper by Łuka (1963) was not discussed or elaborated on in detail). Moreover, some researchers claimed that hoards were not suitable for research on settlements patterns (cf. Jankuhn 1983, 25). It is difficult to say whether this approach was so eagerly adopted due

1 On 29 September 2020, the Google search engine indicated 61,100,000 results with the phrases 'landscape' and 'archaeology', and 517,000 results with the phrase 'landscape archaeology'.

to the need for new information to better understand the phenomenon of the mass deposition of goods, or because the assumptions of landscape archaeology fit so well with the specifics of hoards research. It is also impossible to list all the works that fit into this research trend as they are based on various data and use many research methods. The work by Fontijn (2002) should certainly be mentioned as one of the pioneering and influential ones. A recent Bradley (2017) book may also provide a summary, gathering numerous examples of landscape hoards research.

The concept of landscape archaeology, especially in the phenomenological version proposed by Tilley (1994), is received differently in various parts of the world. It is undoubtedly easier to study the landscape with Tilley's methods (1994) in regions where the relics of ancient communities are also omnipresent in the modern landscape. For example, they are numerous in the British Isles — for instance in the River Boyne basin — and perhaps this is why landscape archaeology is so important in the archaeology of the British Isles. On the other hand, in Australia, the paradigm of landscape research may be combined with anthropological observations, which makes it possible to pose very detailed research questions.

In Polish archaeology, despite the frequent use of the term 'landscape', one should rather talk about the development of settlement studies often supported by GIS tools than the phenomenology of archaeological landscapes. There are few places in this part of Europe that persisted in the landscape from prehistory to modern times, which would fit into the physical world and the world of meanings in subsequent eras. The lowlands, characteristic of most of Poland, have been intensively used in agriculture for centuries. The diligence of farmers, supported by increasingly more advanced technology, removed any remnants of the past from the older layers of the landscape palimpsest. And these very places — permanent, extraordinary, full of meanings, both natural and man-made — and remembering them[2] allow us to become one with the landscape and fully understand it. This does not mean, of course, that prehistoric landscapes are completely inaccessible to modern researchers. It is possible, *inter alia*, thanks to a reference to the natural landscape, even as changed as in the case of the Central European lowlands.

The terrain forms so monumental that they have been preserved in this lowland landscape are wide ice-marginal valleys formed during glacier regression in the Late Pleistocene. Their importance in the past landscapes is indicated by the fact that they separate three main historical regions of western Poland: the Toruń–Eberswalde ice-marginal valley marks the border between Pomerania and Wielkopolska, whereas the latter region and Silesia are separated by the Baruth–Głogów ice-marginal valley (Fig. 7.1).

Of course, to study the meanings given in past landscapes, we must refer to specific archaeological finds. In this study, this pertains to hoards. They are usually placed in two-dimensional geographic space as dots on maps covering vast areas (e.g., Sprockhoff 1930 and many later works). In the present text, I would like to look at the hoards not from the perspective of Central Europe, the Old World, the globe, or even the universe but to study them from a very local perspective.

I will focus on two microregions about 160 km apart that differ a lot but bear several important similarities: (1) both are associated with ice-marginal valleys, (2) the hoards of Bronze Age metal artefacts are exceptionally numerous there, and although many aspects of the act of deposition differ in these findings, (3) there are indications that the artefacts were deposited in selected places of special function and significance (Fig. 7.1).

Between Pomerania and Wielkopolska — Rosko

Rosko is one of the villages situated along the road running parallel to the Noteć River. Late Bronze Age (LBA) and the Early Iron Age (EIA) necropolises have been discovered on the territory of every modern village in the area. The collected information suggests that these were often large cemeteries with hundreds of burials each. Unfortunately, they were not excavated in a planned manner. We know of two extensive cemeteries (Fig. 7.2) from Rosko itself (Kaczmarek 2002a, 223; 2002b; Maciejewski 2016, 124–26; Szamałek 2009, 49–51). Archaeological interpretations indicate that for the communities of this period, places of funerary practices were the centres of local settlements (Mierzwiński 1994, 16). There are also four hoards of bronze artefacts from Rosko (Fig. 7.2), one of them is dated to the Early Bronze Age (EBA), and the remaining three are from the LBA (Blajer 2001, 322, 328, 334; Maciejewski 2019b). Apart from cemeteries and hoards, other available sources also indicate an extensive settlement of this area in the LBA and EIA (Fig. 7.2).

The hoards from Rosko are not the only ones known from the Noteć catchment, there are also finds from Stefanów, Marianów, Wieleń, and Radolinek (Maciejewski 2016, 124–26). However, in this context, the assemblages of metal artefacts from Rosko are

2 The memory of the meanings given to characteristic places in local landscapes, as well as stories and names attributed to them, were in many cases obliterated in this part of Europe as a result of border changes and mass migrations in the mid-twentieth century.

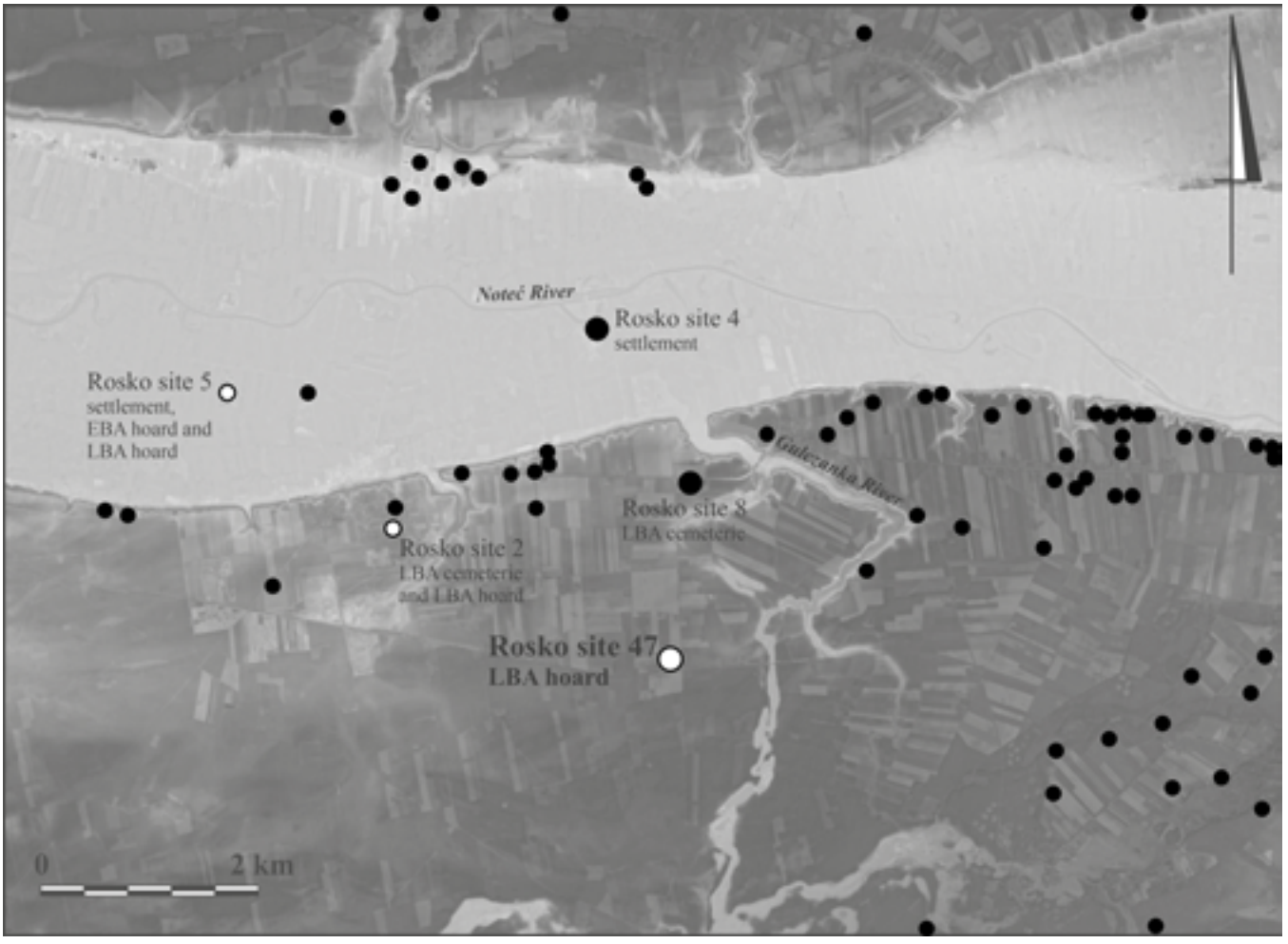


Figure 7.2. Location of the Late Bronze Age and Early Iron Age archaeological sites near Rosko, including hoards. Map by the author. Data — orthophoto map and digital elevation model made using data available at <www.geoportal.gov.pl> — WMS service [accessed 4 September 2023], archaeological data after Maciejewski 2016.

exceptional. The EBA hoard (BrA1/BrA2–BrB — *c.* 1700–1400 BC) consisting of five simple ornaments (probably necklaces) is one of the few in the area evidencing settlement from that period. What is even more significant is that finds of metal objects from EBA are quite rare, not only in terms of the northern Wielkopolska region (Blajer 2001, 322; Maciejewski 2018a). This hoard was discovered on a small sand hill (Rosko Site 5; Fig. 7.2) at the bottom of the Noteć Valley. A hoard dated to the LBA (Ha B2–3 — *c.* 950–800/750 BC) was also found on this landform. As indicated by archival information, it was placed under a large, three-hundred-kilogram stone, and its inventory is much more varied. It consisted of thirty bronze artefacts, including axes and sickles, necklaces, bracelets, and fibulae, an almost 30 cm long richly ornamented bronze spearhead, and a bronze vessel. The set was accompanied by a bronze fragment referred to as a bar by some researchers (Cofcianka 1949). Based on the analysis of the hoard, some authors suggest that it was not deposited in a single act but successively, over a longer period (Kaczmarek 2002b, 53–54). The unpublished results of excavations — covering only trenches — indicate that the area was definitely inhabited in the LBA and EIA. Thus, at least in the LBA, the hoard was buried in the area inhabited at the time of deposition, probably in or around a settlement. Unfortunately, it is not possible to draw more precise conclusions about its socio-topography, nor about the position of the stone under which the hoard was placed in the system of structures and meanings functioning there.

Another hoard also comes from the place used by the Lusatian Urnfields (LUF) communities, this is a cemetery, Rosko Site 2, and a hoard dated to HaA2 (*c.* 1100–1050 BC). Thirteen bronze artefacts (winged axes and sickles) were placed in a pot placed on a stone 'pad' (Blajer 2001, 328, 334). Although the deposit was discovered during excavations, these occurred in 1910,

and the documentation (if any) is not known to the author. This necropolis has been explored many times, mainly by local antiquarians and other amateurs. In the 1920s and 1930s, it was also devastated by local people who obtained stones for construction purposes there. The artefacts acquired during this period were not properly described, what is more, many found their way into private collections and have been consequently unavailable for study. The only research that respected the principles of archaeological methodology was the work carried out in 1962, during which only six graves were uncovered (Kaczmarek 2002b, 48–49, 53). Therefore, in this case too, nothing can be said about the place where the hoard was deposited within the space creating the specific ritual landscape of the cemetery.

The last and, in fact, the most interesting in the perspective of the presented narrative is the hoard discovered in 1985 (Rosko Site 47), the relics of which were documented during excavations in 2001 and 2002 (Maciejewski 2019b). The discovery of this assemblage — consisting almost entirely of bronze socketed axes[3] — has been described more than once, similarly to the archaeological data revealed during the excavation. In the context of our discussion here, it is important that the results of the excavation and testimonies of witnesses indicate that the metal artefacts were placed within a monumental stone-and-earth structure created in connection with depositing them. This observation makes it possible to indicate other functions of hoards than those generally proposed in numerous archaeological publications. The hoard from Rosko Site 47 was not deposited to hide it, as the place of deposition was ostentatiously marked in the landscape and given meaning. The circumstances of discovery of the remaining LBA metal artefact hoards from Rosko indicate that they were also deposited as part of very particular acts that required the participation of a larger group, just like in the case of the deposition (or multiple depositions) of bronze artefacts under a 300 kg boulder. The places where it was done had their meaning, purpose, and their location was known to members of the local community or perhaps even to a larger group of people.

An extensive model interpreting the meaning of depositing an assemblage of metal artefacts from Rosko Site 47 has already been presented in the previous account (Maciejewski 2016). It focuses on the ambiguous symbolism of borders and metal and the similarities in the perception of these cultural categories by LUF communities. Why are borders considered? Because the described hoard and most of the deposits presented in the cited work were placed on the outskirts of the inhabited areas (Fig. 7.2).

In the case of Rosko, there is one more factor that caused artefacts of such value (in our interpretation) to be placed here. The hoard from Rosko Site 47 was deposited near the course of the River Gulczanka, a small tributary of the Noteć (Fig. 7.2).

What is so special about that? After all, in the Central European lowland landscape, there is always some stream in the area. However, this is not the case here. The specific natural conditions mean that this stream was of greater importance than other similar ones. It is related to glacial and post-glacial processes that have left a significant mark on the area. There is a moraine zone to the north of the wide Noteć Valley, and to the south, the largest dune field in the Polish Lowlands is located. Referring to the data on topography, the hydrological system, as well as access to groundwater and soil, it is possible to clearly define areas that provided beneficial conditions for prehistoric settlement and those where it was difficult or even impossible to settle. In this case, the dune field had the biggest impact. The dunes occurring in the central, uppermost part of this region reach relative heights between 20 and 40 m. There are also no watercourses and reservoirs here, and access to groundwater is difficult. Today, pine forests grow over the low-quality soils, and palynological studies indicate that this was also the case in prehistoric times. Moreover, these analyses do not indicate any anthropopressure in the period in question (Fig. 7.3; Kondracki 2002, 128–29; Graf 2008; Maciejewski 2005, 17–48; 2016, 125–26; Kozarski and Tobolski 1963; Tobolski 1962).

To the east of this area devoid of watercourses flows the Gulczanka, which, together with tributaries of the Warta — the Smolnica and Kończak, connects the Noteć catchment with the Warta area (Fig. 7.3). In a world without maps, compasses, and satellite navigation systems, rivers could be one of the basic route markers. The fact that they could indicate the directions of potential journeys would be even more important than their transportation potential (Maciejewski 2016, 49–51, further literature there). Of course, the dune field did not constitute an uncrossable barrier for potential LBA and EIA travellers, but natural pathways have always connected people, and it is likely that the dunes area was not inhabited. On the other hand, a potential route along the Gulczanka, and further on the Smolnica or Kończaka, connected the Noteć and Warta areas, i.e., two significant settlement agglomerations in the LBA and EIA (Kaczmarek 2002a, 221–22; 2005; Maciejewski 2008; 2016, 131–35).

Another important element is the sand hill (Rosko Site 4) located at the mouth of the Gulczanka to the Noteć, similar to the site where two hoards were

3 We know of seventy-one items that make up the hoard, sixty-seven socketed axes, mostly two very similar Czarków and Przedmieście types, as well as two bronze casting moulds for the production of such items.

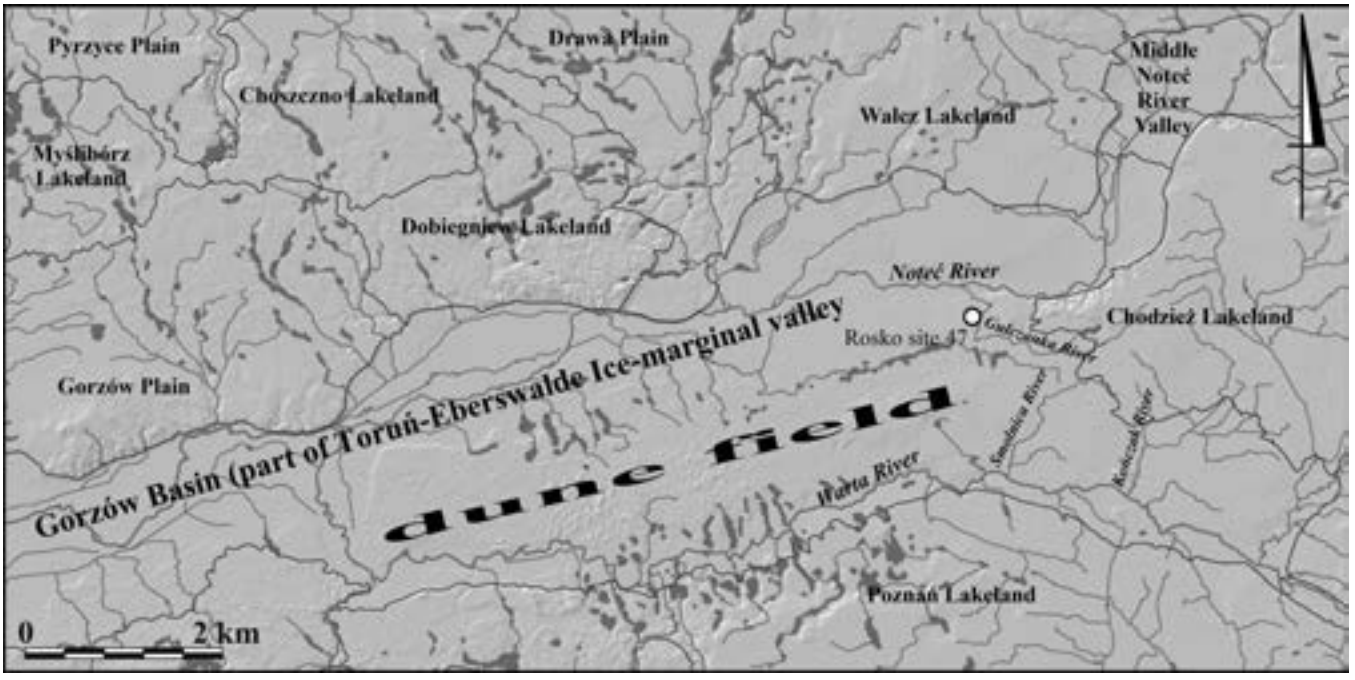


Figure 7.3. Terrain shape and the hydrological network of the Warta–Noteć interfluve dune fields compared to other geographical regions of the Toruń–Eberswalde ice-marginal valley and the surrounding Pomeranian and Wielkopolska Lakelands. Map by the author. Data — digital elevation model made using data available at <www.geoportal.gov.pl> — WMS service [accessed 4 September 2023], the hydrographic data based on Komputerowa Mapa Podziału Hydrograficznego Polski available at <www.dane.gov.pl> [accessed 4 September 2023], geographic mesoregions after Kondracki 2002 and amended by Solon and others 2018.

discovered (Rosko Site 5). Excavations at Rosko Site 4 revealed a very rich and diverse collection of archaeological finds (over 15,000 artefacts, with the majority constituting potsherds, pots, and flint tools, as well as 246 archaeological features). Importantly, the studies carried out at this site resulted in not only traces of settlement spanning from the Mesolithic to the EIA but also many objects suggesting contacts with various Central European regions, including foreign-style metal artefacts, potsherds, and entire pots (Jankowska and Pyżewicz 2006; Maciejewski 2005; 2006; 2018a; 2019a; Michałowski 2006, 192–93; Niedźwiecki 2005). Thus, the site may be interpreted not only as a point chosen for thousands of years by communities operating in and around Rosko but also as a potential river crossing spot. This is indicated by the location near the Noteć riverbed, as well as the discovered artefacts.

The intensive settlement, an exceptional number of rich hoards, artefacts — not only metal ones — indicating interregional contacts, and specific natural conditions give the Gulczanka a special meaning, as well as comprising the unique context and location of one of the hoards. All these factors indicate the importance of the Rosko area on the LBA and EIA routes as a place for crossing the wide Noteć Valley.

Why here? It is difficult to find a clear answer referring solely to the natural data. While to the west of the Gulczanka the dune field may create a strip that was difficult to cross, there were many potential routes to the east. The Noteć Valley near Rosko narrows slightly, but the same goes for several other places within a radius of 30 km. Except in one case, the slopes of the valley sides are fairly gentle. The settlement has always been very intense in the region, not only in the LBA and EIA but also in all prehistory and historical times (Machajewski and Maciejewski 2010; 2013). Therefore, it should be assumed that not only the vicinity of Rosko was a convenient place for crossing the Noteć and its valley. On the other hand, it is best documented archaeologically for this particular area. The incidental nature of the local settlement from later periods (Machajewski 2002; Wielgosz 2006; Wyrwa 2006) may suggest that with the dusk of the urnfields-based cultural model, the significance of the crossing diminished, as early medieval strongholds indicate where it was important in later times.

Crossing the river in the LBA and EIA period (as well as before) could be influenced by the aforementioned sand hills (Rosko Sites 4 and 5). These landmarks could be clearly visible from the edge of the valley but also play a much more important role. The communities living on the Noteć near today's Rosko could assist travellers in crossing the river, showing them the way, lending boats, providing accommodation, or benefitting from the situation in many other ways.

At that time, the Noteć was unregulated, flowed in many beds, and had numerous backwaters, resulting in swamps, wetlands, and lakes of various sizes. The valley was also densely covered with riparian and alder forests (Maciejewski 2016, 125–26; Wyrwa 2006). These sand hills, or rather the people living there, could play a significant role when crossing not only the river but the entire valley. Thanks to this, the group functioning in such a total service system (Mauss 1973, 210–331) could gain the gratitude of wanderers, which might have been expressed in many ways, such as disseminating information on the surrounding world or facilitating future trips (after all, the gift of hospitality had to be reciprocated). It could also help in winning the favour of supernatural powers (in Greek and Germanic myths, Homeric epics, and Scandinavian sagas, gods often travelled among ordinary people and often assumed inconspicuous appearance). It could also mean support in times of conflict or functioning in harmony with neighbours. Marital exchange was also used as a form of currency. Finally, it was possible to obtain valuable raw materials and items of an unusual provenience. Today we are able to recognize only a few of these goods, but there are many indications that bronze was one of them, and there was plenty of it in the vicinity of Rosko.

Looking at the detailed context of the Rosko hoard, it is also interesting that the metal objects were not deposited in the centre of the stone-earthen mound but in its northern part (Maciejewski 2019b, fig. 2). This may mean that geographical directions (or, more specifically, the circadian cycle) were important to the community and this can be interpreted taking into account the meanings given to the circadian cycle in the cosmologies of traditional societies (see Maciejewski 2016, 56, 165, further literature there). Alternatively, it can also indicate that the Noteć River and the potential crossing were located north of the stone-earthen mound.

Navigating routes without physical form, based on stories about encountered places, required marking and knowledge of these landmarks; some were created by nature, others by people. Rivers undoubtedly fulfilled such a function, and although other landmarks were also useful, man-made structures transferred meanings understandable to individuals operating in a similar cultural system: 'Walk all day along this river until you reach a large mound. A gift was placed there, its location will show you the way' — can you imagine a better description in a uniform lowland landscape covered with forests? The mound was both a sign on the route and a border marker of particular importance as the route became difficult further on. The travellers had to cross the river flowing through a wide valley with numerous backwaters and dangerous swamps and make their way through a dense forest. The monumentality of the area emphasized the importance of this particular section of the route. It could also indicate the power (real or symbolic) of those who helped in crossing the river, as well as their right to require another gift in return for their hospitality, e.g., a metal object.

Between Wielkopolska and Silesia — Karmin

The name Karmin does not exist in official local censuses. In the past, the name was used for a hamlet, the majority of which was incorporated into the village of Postolin. However, at the turn of the nineteenth and twentieth centuries, when three of the hoards described here were discovered, they were referred to as the Karmin hoards, which is why the name has been adopted in archaeological publications.

As often happens, the circumstances in which the hoards were discovered make reconstructing the acts of deposition difficult. The first hoard was found in 1883. We do not have more detailed information about the circumstances of its discovery, but the archives include a description and illustrations of the positioning of the artefacts. Some of the metal items were placed in two pots, which were lined with axes, sickles, and bronze spearheads (Fig. 7.4; Baron and others 2019, 8–13, fig. 2). Some of these relics found their way to Wrocław and Berlin, others were retrieved by archaeologists after some time or lost forever. The second hoard discovered during the drainage works in the spring of 1892 followed a similar or even more complicated path. Bronze items were scattered among the witnesses. Nobody was interested in the pot that was part of the set. Over time, the artefacts made their way into museum collections, mainly in Wrocław and Berlin, but also in smaller towns, including Milicz (Fig. 7.4; Baron and others 2019, 13–16). On the other hand, the artefacts from the third hoard went directly to the Wroclaw Museum. The assemblage was discovered during agricultural work in 1904, when a cracked pot with metal items was discovered about 60 cm underneath the ground level, covered by a stone. The potsherds recorded during the on-site inspection that took place immediately after the discovery confirmed the location of the deposit (Fig. 7.4; Baron and others 2019, 16).

The Karmin hoards were known to Polish and German archaeologists for years and referred to in numerous regional and thematic studies (Baron and others 2019, further literature there). However, the exact location of all three hoards was known (marked on a 1:25,000 topographical map — *Messtischblatt* — and published, among others, by Seger 1936, fig. 74; see also Fig. 7.4), no analytical reference was made to these pieces of information. The accidental discovery of the fourth hoard in the summer of 2017, also partially

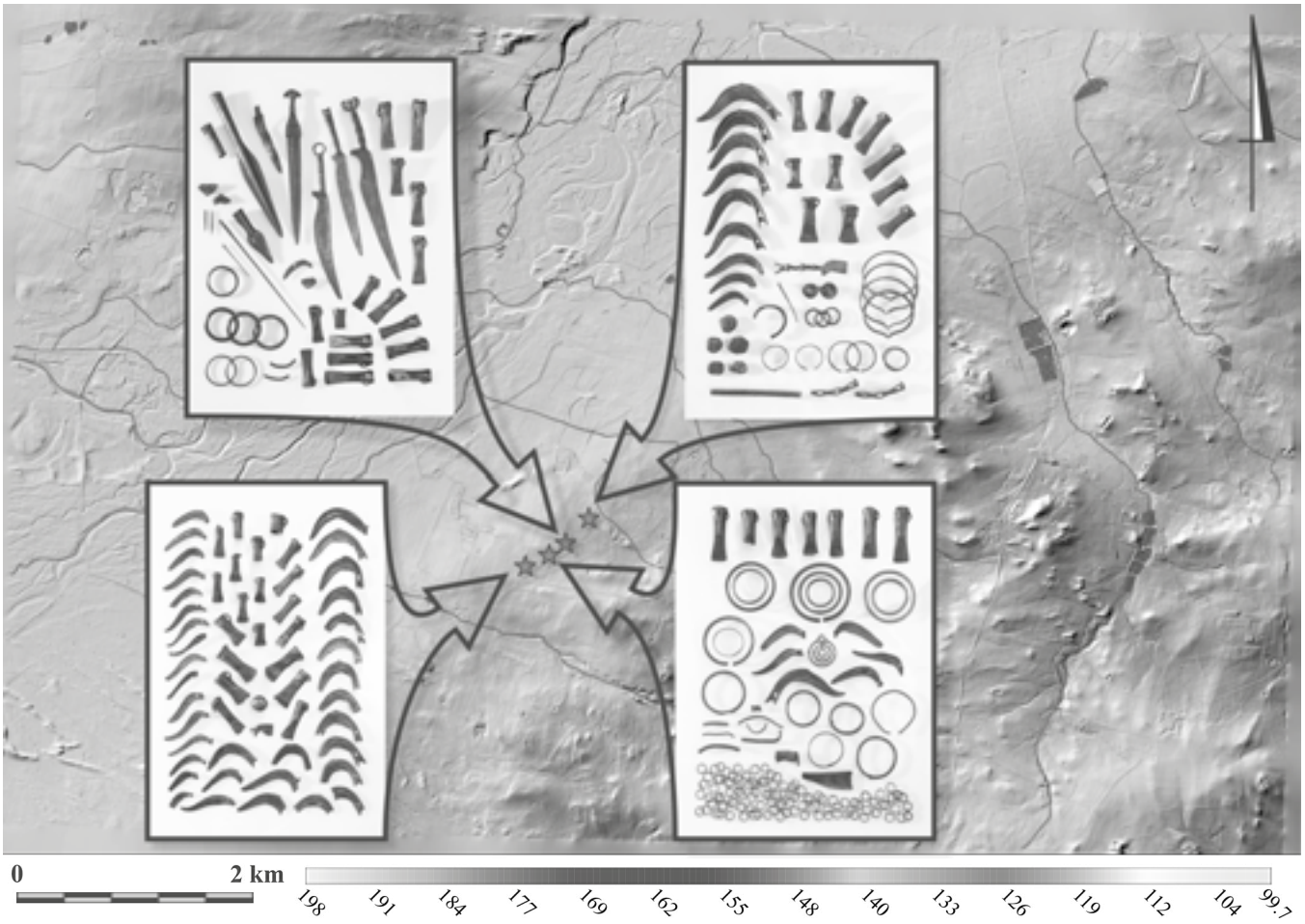


Figure 7.4. Location of the Karmin hoards along with the artefacts from Wrocław collections. After Baron and others 2019. Data — photos by T. Gąsior. Digital elevation model by P. Wroniecki, based on the ISOK project data, hydrographic data based on Komputerowa Mapa Podziału Hydrograficznego Polski available at <www.dane.gov.pl> [accessed 4 September 2023] with amendments.

deposited in a pot (or pots), became the impulse for a detailed study of all assemblages, including an analysis of their deposition locations in the landscape. The study turned out to be cognitively interesting as all the hoards were placed in a line at approximately similar 150–200 m intervals (Fig. 7.4). Of course, we know places from the Bronze Age where numerous metal artefact deposits were made, sometimes throughout a longer period. Such examples are known from the Czech Republic, such as Praha-Dejvice and Tetín (Vachta 2016, 97–106), the Rabenwand area in Austria (Windholz-Konrad 2012), and recent discoveries from the French Jura near Salins-les-Bains (Gauthier and others in this volume), and twin hoards from Hungary (Tarbay in this volume). However, the Karmin hoards are unique — not only in Poland but, to the best of the author's knowledge, also in the entire continent. Additionally, it should be emphasized that all these hoards have a similar composition. The collection in Wrocław Museum includes 145 items from hoard I (106 small bronze rings, allegedly coming from a 700-piece set of similar artefacts), fifty-eight artefacts from hoard II, forty-three items from hoard III, and forty-one from the last deposit (cf. Fig. 7.4). Most of them are local forms, artefacts made in a foreign style may also be distinguished, e.g., Chernogorovka type cheekpieces related to the 'Cimmerian horizon', a Kabardino-Pyatigorsk type dagger with Eastern European references, a Haslau-Regelsbrunn type spectacle fibula that shows Balkan and Greek influences, or a unique knife with an antenna-shaped hilt. Each hoard included items of varied functions. Typological findings make it possible to place them in the same period: Ha B2–3. Another similarity in all depositions is that the artefacts, or at least some of them, are placed in pots (Baron and others 2019, 19–39).

In summary, we know of four hoards from Karmin placed in a line and in a similar way. Moreover, they were all deposited at the same time. Obviously, given the specifics of the archaeological methodology, this

could have happened on the same day or over several generations (between 950 and 800/750 BC).

According to the description, one of the hoards was secured or perhaps marked with a stone. Why would that be important? Because we can assume that this linear pattern was not random, not with such clear purposefulness. The number of finds (245 known hoards — Blajer 2001, 341–54, and the new ones) known from the analysed period (Ha B2–3 — about 150–200 years) would make them exceptional. Such a number would amount to less than two hoards deposited annually in the entire territory of Poland where hundreds, if not thousands, of local communities, functioned simultaneously. Even if we only know about 10 per cent of all hoards, such a frequency would still not be many. Such a calculation suggests that the act of depositing metal items was a rare event for those communities, hence the hoards may be considered exceptional, and all the more so in the case of the hoards placed in a line, which are unique.

The doubt expressed earlier as to whether the hoards were deposited at one time — either in parallel (one day) or only to the extent available to us from the perspective of three thousand years (one archaeological period) — is significant because if the acts of deposition occurred at longer intervals (more than one generation apart), the places had to be known not only to the depositing individuals but also function in the landscape-related memories passed on to next generations. Moreover, it is also very likely that they were marked in a special way. Of course, depositing metal items in short intervals (less than one generation) does not exclude the above conclusions either. The case of Rosko presented earlier proves that it could be so. Both possibilities raise the question of why this line was so important for the local community that several hundred artefacts made of rare and valuable metal were laid along it.

In this case, reading the pattern of dots on the map is also possible thanks to a reference to natural conditions. The Karmin hoards were also placed near an ice-marginal valley (Baruth–Głogów) constituting the historical border between Silesia and Wielkopolska (Fig. 7.1). More specifically, they were deposited in the area between two large structural basins. Without going into the details of the geomorphological processes shaping these clear and wide depressions, it is important to indicate that their nature was similar to the previously described Noteć Valley. Before intensive hydrotechnical works were carried out in the area, the Barycz, which flows in this part of the Baruth–Głogów ice-marginal valley, forked into many channels. The depressions were marshy and overgrown with forests and dense undergrowth. A belt of hills formed by the front moraine runs parallel to the valley. The Karmin hoards were deposited within the Krośnickie Hills, cutting between the two basins — a higher terrain form creating a natural bridge that made it possible to shorten the travel distance and thus called the Milicz Gate. Two similarly narrow spots are located about 50 km to the west (related to the Oder River) and 50 km to the east, in the Prosna river basin (Baron and others 2019, 102–58; Kondracki 2002, 155–58, 163–72, figs 24–26; Ranoszek 2003). Therefore, unlike in Rosko, here we have a clear indication (based on natural data) suggesting that there was a route here. As was stipulated before, such passageways used to connect people. Can this be confirmed by archaeological data?

The dominant role of Silesia in the development of the LUF society has been emphasized more than once, cultural patterns developed in this region had an intense impact on western Wielkopolska and the Lubusz Land (Kaczmarek 2012, 236; 2017, 286–88). From the very beginning of the LBA, the main axis of interaction (migration) was the Oder and Obra Rivers (Kaczmarek 2012, 236–50; cf. also Mierzwiński 1994; Lasak 1996; 2001). In turn, contacts with eastern Wielkopolska (including the Pałuki region), as well as Kujawy and the Chełmno Land, would have run through the Milicz Gate, but in this case, their chronological dynamics were different. Both settlement studies of the Milicz Gate area and interregional contacts analysis indicate that interactions involving the use of the narrowing described above gained importance at the end of the Bronze Age (Ha B2–3) — when the Karmin hoards were deposited — and were most intense in the Early Iron Age (HaC), when, on the one hand, Silesian groups strongly influenced by the (eastern) Hallstatt circle were developing dynamically, and on the other, the cultural image of Pałuki and Kujawy changed significantly (Mierzwiński 1994; Lasak 1996; 2001; 2011; Kaczmarek 2012, figs 95, 96).

Observations on the microregional scale are equally important for understanding the meaning of the Milicz Gate and the Karmin hoards. Settlement in this area occurred already at the beginning of the LUF, although it is quite incidental. In the subsequent stages of the LBA and EIA, it intensifies, in line with the previously outlined pattern. In the regional distribution of settlement, one's attention is drawn to the northern edge of the Barycz Valley. This is where the Miłosławice cemetery is located, with its numerous spectacular artefacts (Lasak 2011). The vessel from Sułów, one of the most spectacular HaC bronze artefacts known from Poland, also comes from this area.

On the southern side, traces of LBA and EIA activities are not so numerous. In trying to understand the significance of the location of the Karmin hoards, attention should be paid to a small concentration of settlement points involving a necropolis formerly known as the Karmin cemetery (now Postolin Site 4)

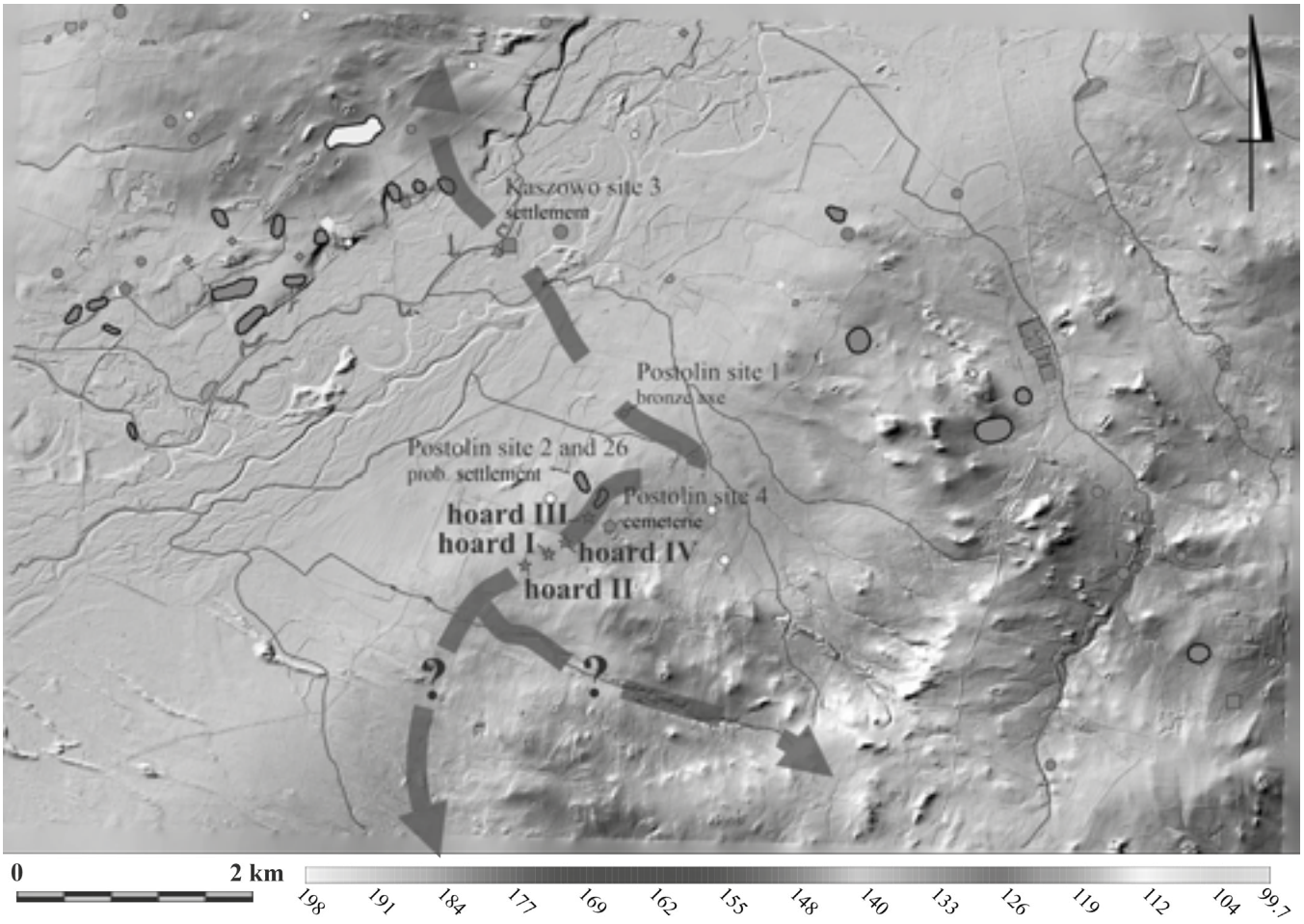


Figure 7.5. The potential crossing of the Barycz Valley, taking into account the Late Bronze Age and the Early Iron Age archaeological sites. After Baron and others 2019. Data — digital elevation model by P. Wroniecki, based on the ISOK project data, hydrographic data based on Komputerowa Mapa Podziału Hydrograficznego Polski available at <www.dane.gov.pl> [accessed 4 September 2023] with amendments.

and two sites only known from fieldwalking research: Postolin Site 2 with thirty-one LBA and EIA potsherds and Postolin Site 26 with nineteen LBA and EIA potsherds (in short, this is a large number of finds from the surface for the period, area, and research methodology in question). To the south-west of this group of archaeological sites which probably represents a small microregion, or rather a settlement cluster (a settlement plus a cemetery), hoard III is located, and the next ones are situated further along the line.

Another bronze item (a socketed axe) was discovered to the east of the Karmin hoards and the described settlement cluster on the slope of the valley. Importantly, it was located between two small watercourses, one of them marking the route towards the settlement functioning at the turn of the LBA and EIA — Kaszowo Site 3. It is located at a slight elevation at the bottom of the Barycz Valley, similar to the settlements near Rosko. About 120 m away is an early medieval stronghold, excavated for many years. Although LBA and EIA potsherds are known from the surface of the site (fieldwalking research), no other finds indicate that a settlement functioned at this location in the LBA and EIA. Despite this, the relics of the later stronghold are of great importance in understanding the meaning of the Milicz Gate as a convenient crossing. To the north, the edge of the plateau is clearly less steep than in other zones. It is difficult to say whether it is natural or anthropogenic. No road nor any other modern construction crosses the edge of the upland in this place, so it can be assumed that also in the LBA there were favourable conditions to enter the plateau here (Fig. 7.5; Baron and others 2019, 102–58).

If we interpreted hoards as route markers, in this case, it would not just be one point but a whole set. Characteristically, it leads us back to the local community that could help with crossing significant natural limes. In the inventory of deposits located closer to the settlement cluster, there are more spectacular and unique artefacts (in modern archaeologists' opinion and to the best of our

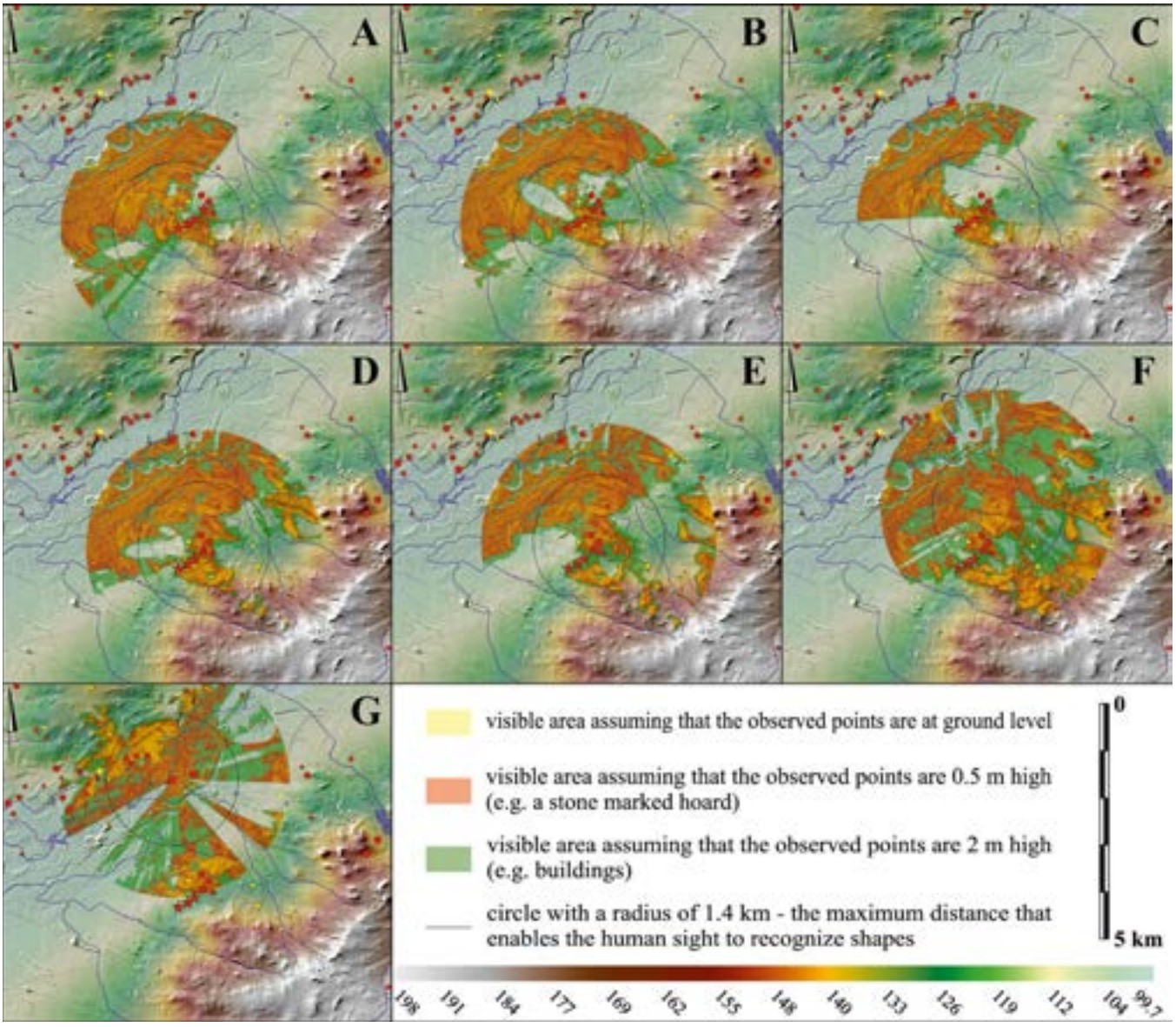


Figure 7.6. Potential visibility from where hoard II (A), hoard I (B), hoard IV (C), hoard III (D), and a bronze socketed axe (F) were discovered, as well as potential visibility from the site of the hypothetical settlement on the southern edge of the Barycz Valley — Postolin Sites 2 and 26 (E) and from the settlement at the bottom of the Barycz Valley — Kaszowo Site 3 (G). The analysis was made using QGIS version 2.18.4, and the Visibility analysis for QGIS ver. 0.5.4 — Čučković 2016; maximum view range — 2.5 km; observer height — 1.6 m. After Baron and others 2019. Data — digital elevation model by P. Wroniecki, based on the ISOK project data, hydrographic data based on Komputerowa Mapa Podziału Hydrograficznego Polski available at <www.dane.gov.pl> [accessed 4 September 2023] with amendments.

knowledge, of course), such as cheekpieces, a spectacle fibula, a dagger, knives, and bronze spearheads (see Fig. 7.4).

In this case, one can even try to follow a hypothetical route marked by these points and try to analyse what the potential traveller could see from these landmarks. This can be done using potential visibility tests (broadly described among others by Wheatley and Gillings 2000). In the presented visualizations the author assumed that the observer is 1.6 m tall, and the observed point is at the level of: a) the ground (e.g., an unmarked place of the hoard deposition), b) 0.5 m (e.g., a stone marking the deposition place), and c) 2 m (e.g., a low building). Following this line, we can point to subsequent hoards, the settlement on the edge of the valley (Postolin Sites 2 and 26), the site with the bronze socketed axe, and the settlement at the bottom of the valley (Kaszowo Site 3). The analysis carried out in this way helps to understand the meaning of all these sites (Fig. 7.6).

Moving from one hoard to another, the observer had a clear view of the valley and the settlement at its

bottom. When examining its visibility, the top height should be assumed at a level of at least 2 m. If the hoard was not marked in any way or was marked with an object of 0.5 m (e.g., a stone or wooden construction), the observer did not see all the places of deposition when standing at the most south-western hoard. Other places appeared only after reaching the subsequent point (Fig. 7.6). However, as the route along the hoards led to the settlement, its buildings, particularly the smoke from the hearths, were undoubtedly visible from the place of deposition of hoard II. Thus, it was not necessary to follow the line of landmarks to reach it. Still, following the route must have made a difference to the LBA and EIA community. Creating a corridor could indicate the importance of the crossing, manifest the wealth of the community, or protect it in a magical way by designating subsequent places of passage — entrances to the zone where the host wanted to emphasize their rights (just like Roman milestones — e.g., Czarnowski 1956, 231; Leeuw 1978, 90).

Reaching the potential settlement or the site intensively used in another way in the LBA and EIA (Postolin Sites 2 and 26), one could see the panorama of the entire valley. There is also another point indicating a route — the place where the bronze socketed axe was deposited (the fifth Karmin hoard?). This artefact was discovered between two small watercourses, and using the good visibility of the settlement located at the bottom of the valley as a criterion, this place does not seem to be an important landmark. Although it should be pointed out that it determines the optimal place (i.e., not required to cross any body of water) to go down the valley to the settlement located at its bottom, obviously assuming that the above-mentioned streams flowed in a similar way as today. There is a very good view of the northern edge of the Barycz Valley from the settlement.

Here, as in the case of Rosko, the hoards mark the route and carry a range of culture-specific messages. Likewise, at the end of the route lived a local community that helped, organized, and controlled, but most importantly developed in a given landscape, a world of cultural meanings and rules. It formed a link in the functioning of what we call the LBA world, based on contacts and journeys, as evidenced not only by traditional interpretations of the spread of metal artefacts but also by the latest research (e.g., Frei and others 2015).

Rosko and Karmin — Different but Similar

The aforementioned Sprockhoff (1930) was, arguably, the first to connect points (hoards) on a map and delineate Bronze Age routes. Later, many authors followed this path, adding other archaeological data, emphasizing the importance of specific regions, or using the natural peculiarities of different areas in their narratives (for the area studied e.g., Horst 1982; Fogel 1993; Bukowski 1998; Kośko 2002). All the time in archaeology the so-called amber route (e.g., Czebreszuk 2011) and other similar highways of prehistory are discussed. Of course, one should consider whether these are lines on a map or zones of intense contact. Discussing the whole complexity of this problem is a topic for a separate paper. This was not my goal, nor was my goal to correct earlier researchers. It was to show that different perspectives make sense, and only in this way can we better understand the phenomenon of deposition of metal objects.

The Rosko hoard and the metal artefacts from Karmin were deposited at the same time in places about 160 km apart. They differ a lot, the former consisted of selected, similar objects assembled as part of a monumental stone-earthen mound, probably wrapped in fabric. It also constitutes a single find on a hypothetical route. Metal item hoards found in the vicinity of the Milicz Gate have a more varied composition. We do not know if their location was marked, but they were deposited in pots. Moreover, they indicate a certain pattern. According to the presented interpretation model, both the Rosko and Karmin hoards had similar functions and meanings in the landscape, transmitted through the act of deposition and the memory of it. Restricting ourselves to typological analysis, taxonomic findings, and other tools of classical hoard research would not point out these similarities but rather highlight differences between the finds. The question then arises, do these differences lead to any conclusions? On the one hand, one could point to the already mentioned extraordinary (incidental) act of depositing metal items, something that did not happen often, and thus did not use a pattern of behaviour that would leave identical testimony three thousand years later. However, this would be a simplification in the author's opinion. It is more intellectually inspiring to point out that these differences can also help us understand some aspects of the mass depositing of goods, especially if we look for similarities to a huge group of other hoards known to us (cf. Maciejewski 2018b).

In this context, it is inspiring to recall how messages were communicated by preliterate societies. In the realities of oral cultures, the content was transmitted with the use of various media, e.g., a story, a song, a pot's form and ornament or through bronze artefacts (including the ritual of depositing metal objects). It is important to indicate that three basic techniques could be used in conveying content in traditional communities: redundancy, addition, and variation on

the original (Gralak 2017, 50). Studying whether the hoards repeat certain cultural messages characteristic of the LBA and EIA, whether content is added in subsequent depositions, and to what extent they are variations on a given ritual pattern remains a task for the future. In these considerations, it cannot be ruled out that the differences between some hoards indicate that the acts of deposition conveyed completely different content and that not all hoards formed one category, and not all had the same functions and meanings for the LBA and EIA communities, as we often want to think. This, however, is a completely different story.

On the one hand, the specificity of the zones in which the presented hoards were deposited could favour the accumulation of bronze due to their position on the maps of past routes — *mappa mundi* of the Bronze Age world. On the other, it makes it possible to understand the functions and meanings of the hoards in the landscape. Both cases are different and thus complement each other, but they are also similar and therefore reinforce the proposed interpretation. They tell us more about the specifics of travelling at the times of the Egtved Girl (Frei and others 2015) than the lines drawn between successive hoards, imports, or other dots on the map.

Acknowledgements

This research was funded in part by the National Science Centre, Poland, project: *A Biography of Late Bronze and Early Iron Ages Hoards. A Multi-Faceted Analysis of Metal Objects Related to Monumental Constructions in Poland* (UMO-2021/41/B/HS3/00038) and in part by Ministry of Culture and National Heritage of the Republic of Poland project: *Wieloaspektowa analiza zjawiska deponowania przedmiotów metalowych w epoce brązu na przykładzie skarbów z Karmina* (MKiDN 03469/18).

Works Cited

Baron, Justyna, Marcin Maciejewski, Radosław Jarysz, Radosław Kuźbik, Dagmara Łaciak, Jeannette J. Łucejko, Maksym Mackiewicz, Beata Miazga, Kamil Nowak, and Dawid Sych. 2019. *Phenomenon of Repetition: Deposits from Karmin = Karmin: Fenomen powtarzalności* (Wrocław: Uniwersytet Wrocławski)

Blajer, Wojciech. 2001. *Skarby przedmiotów metalowych z epoki brązu i wczesnej epoki żelaza na ziemiach polskich* (Kraków: Księgarnia Akademicka)

Bradley, Richard. 2017. *A Geography of Offerings: Deposits of Valuables in the Landscapes of Ancient Europe*, Oxbow Insights in Archaeology, 3 (Oxford: Oxbow)

Bukowski, Zbigniew. 1998. *Pomorze w epoce brązu w świetle dalekosiężnych kontaktów wymiennych*, Gdańskie Towarzystwo Naukowe, Wydział I Nauk Społecznych i Humanistycznych, Seria monografie, 104; Prace Archeologiczne, 12 (Gdańsk: Gdańskie Towarzystwo Naukowe)

Cofcianka, Aleksandra. 1949. 'Skarb brązowy z Roska i zapinki "łużyckie" V okresu epoki brązu', *Przegląd Archeologiczny*, 8: 38–46

Čučković, Zoran. 2016. 'Advanced Viewshed Analysis: A Quantum GIS Plug-in for the Analysis of Visual Landscapes', *Journal of Open Source Software*, 1.4: 32 <https://joss.theoj.org/papers/a8f76eeda4f92e7d641757ddod7ed7f5> [accessed 24 October 2018]

Czarnowski, Stanisław. 1956. 'Podział przestrzeni i jej rozgraniczenie w religii i magii', in *Dzieła*, III, ed. by Nina Assorodobraj and Stanisław Ossowski (Warsaw: Wydawnictwo Naukowe PWN), pp. 221–36

Czebreszuk, Janusz. 2011. *Bursztyn w kulturze mykeńskiej: Zarys problematyki badawczej* (Poznań: Wydawnictwo Poznańskie)

David, Bruno, and Julian Thomas (eds). 2008. *Manual of Landscape Archaeology* (Walnut Creek: Left Coast)

Fogel, Jerzy. 1993 'Uwagi o niektórych faktorach i szlakach wymiany ponadregionalnej na Pomorzu na przełomie epoki brązu i żelaza', in *Miscellanea archaeologica Thaddaeo Malinowski dedicate*, ed. by Franciszek Różnowski (Słupsk: Sorus), pp. 137–46

Fontijn, David R. 2002. 'Sacrificial Landscapes: Cultural Biographies of Persons, Objects and "Natural" Places in the Bronze Age of the Southern Netherlands, *c.* 2300–600 BC', *Analecta praehistorica leidensia*, 33–34: 1–392

Frei, Karin Margarita, Ulla Mannering, Kristian Kristiansen, Morten E. Allentoft, Andrew S. Wilson, Irene Skals, Silvana Tridico, Marie Louise Nosch, Eske Willerslev, Leon Clarke, and Robert Frei. 2015. 'Tracing the Dynamic Life Story of a Bronze Age Female', *Scientific Reports*, 5: 10431 <https://www.nature.com/articles/srep10431> [accessed 27 October 2018]

Graf, Renata. 2008. 'Warunki formowania lokalnych systemów krążenia wód podziemnych na obszarze Międzyrzecza Warty i Noteci', *Geologos*, 14: 197–210

Gralak, Tomasz. 2017. *Architecture, Style and Structure in the Early Iron Age in Central Europe* (Wrocław: Uniwersytet Wrocławski)

Horst, Fritz. 1982. 'Die jungbroze- und früheisenzeitlichen Hauptverbindungswege im nördlichen Mitteleuropa', in *Południowa strefa kultury łużyckiej i powiązania tej kultury z południem*, ed. by Marek Gedl (Kraków: Instytut Archeologii Uniwersytetu Jagielońskiego), pp. 231–45

Jankowska, Dobrochna, and Katarzyna Pyżewicz. 2006. 'Materiały krzemienne ze stanowiska 4 w Rosku, gm. Wieleń', in *Pradolina Noteci na tle pradziejowych i wczesnośredniowiecznych szlaków handlowych*, ed. by Henryk Machajewski and Jarosław Rola (Poznań: Stowarzyszenie Naukowe Archeologów Polskich), pp. 53–69

Jankuhn, Herbert. 1983. *Wprowadzenie do archeologii osadnictwa*, Biblioteka muzealnictwa i ochrony zabytków, 74 (Warsaw: Ministerstwo kultury i sztuki, Generalny konserwator zabytków)

Kaczmarek, Maciej. 2002a. *Zachodniowielkopolskie społeczności kultury łużyckiej w epoce brązu*, Seria archeologia, 48 (Poznań: Wydawnictwo Naukowe Uniwersytetu im. Adama Mickiewicza)

———. 2002b. 'Epoka brązu i wczesna epoka żelaza na ziemi wieleńskiej', in *Z najdawniejszych dziejów ziemi wieleńskiej*, ed. by Piotr Waśko, Krystyna Heppner, and Henryk Machajewski (Wieleń: Oficyna Wydawnicza G&P), pp. 43–95

———. 2005. 'Epoka brązu i wczesna epoka żelaza na ziemi obornicko-rogozińskiej', in *Archeologia powiatu obornickiego*, ed. by Tomasz Skorupka (Poznań: Muzeum Archeologiczne w Poznaniu), pp. 127–237

———. 2012. *Epoka brązu na Nizinie Wielkopolsko-Kujawskiej w świetle interregionalnych kontaktów wymiennych*, Prace Komisji Archeologicznej — Poznańskie Towarzystwo Przyjaciół Nauk, 28 (Poznań: Wydawnictwo Poznańskiego Towarzystwa Przyjaciół Nauk)

———. 2017. 'The Snares of Ostensible Homogeneity. Lusatian Culture or Lusatian Urnfields?', in *The Past Societies: Polish Lands from the Evidence of Human Presence to the Early Middle Ages*, III: *2000–500 BC*, ed. by Urszula Bugaj (Warsaw: IAiE PAN), pp. 263–93

Kołodziejczyk, Piotr, and Beata Kwiatkowska-Kopka (eds). 2016. *Landscape in the Past & Forgotten Landscapes*, Cracow Landscape Monographs 2. Landscape as Impulsion for Culture: Research, Perception & Protection (Kraków: Institute of Archaeology Jagiellonian University and Institute of Landscape Architecture Cracow University of Technology)

Kondracki, Jerzy. 2002. *Geografia regionalna Polski* (Warsaw: Wydawnictwo Naukowe PWN)
Kośko, Aleksander. 2002. 'Fluted Maces in Cultural Systems of Borderland of Eastern and Western Europe: 2350–800 BC. Taxonomy, Genesis, Function', *Baltic-Pontic Studies*, 11: 31–81
Kozarski, Stefan, and Kazimierz Tobolski. 1963. 'Wiek gleby kopalnej w wydmach w pradolinie Noteci koło Czarnkowa', *Badania Fizjograficzne nad Polską Zachodnią*, 11: 213–26
Lasak, Irena. 1996. *Epoka brązu na pograniczu śląsko-wielkopolskim: Część*, I: *Materiały źródłowe*, Monografie archeologiczne, 2 (Wrocław: Uniwersytet Wrocławski)
——. 2001. *Epoka brązu na pograniczu śląsko-wielkopolskim: Część*, II: *Zagadnienia kulturowo-osadnicze*, Monografie archeologiczne, 6 (Wrocław: Uniwersytet Wrocławski)
——. 2011. 'Środkowe dorzecze Baryczy – ważna odnoga nadodrzańskiego tzw. szlaku bursztynowego we wczesnej epoce żelaza', in *Nadodrze w starożytności: Konferencja Grabice, 23–30 czerwca 2004 roku*, ed. by Grzegorz Domański (Zielona Góra: Wydawnictwo Fundacji Archeologicznej), pp. 25–43
Leeuw, Gerardus van der. 1978. *Fenomenologia religii*, Seria Religioznawcza (Warsaw: Książka i Wiedza)
Łuka, Leon Jan. 1963. 'O skarbach kultury pomorskiej na Pomorzu Gdańskim (wybrane zagadnienia)', in *Munera archaeologica Iosepho Kostrzewski quinquagesimum annum optimarum atrium studiis deditumperagenti ab amicis, collegis, discipulis oblata*, ed. by Konrad Jażdżewski, Witold Hensel, and Wojciech Kočka (Poznań: Wydawnictwo Poznańskiego Towarzystwa Przyjaciół Nauk), pp. 231–52
Machajewski, Henryk. 2002. 'Ziemia wieleńska u schyłku starożytności', in *Z najdawniejszych dziejów ziemi wieleńskiej*, ed. by Piotr Waśko, Krystyna Heppner, and Henryk Machajewski (Wieleń: Oficyna Wydawnicza G&P), pp. 127–50
Machajewski, Henryk, and Marcin Maciejewski. 2010. 'Weryfikacja chronologiczna stanowisk archeologicznych oraz wytypowanie do wpisu do rejestru zabytków z obszarów "Archeologicznego Zdjęcia Polski" z terenu gminy Wieleń (42–19; 42–20; 42–21; 42–22; 43–19; 43–20; 43–21; 43–22) wyznaczenie skupisk stanowisk na mapach 1:25000' (unpublished report, Wojewódzkiego Urzędu Ochrony Zabytków Poznań)
——. 2013. 'Weryfikacja chronologiczna stanowisk archeologicznych oraz wytypowanie do wpisu do rejestru zabytków z obszarów "Archeologicznego Zdjęcia Polski" z terenu gminy Czarnków, Trzcianka, Ujście (42–23; 42–24; 41–24; 40–24; 39–24; 38–24; 39–25; 39–26; 38–25; 38–26) wyznaczenie skupisk stanowisk na mapach 1:25000' (unpublished report, Wojewódzkiego Urzędu Ochrony Zabytków Poznań)
Maciejewski, Marcin. 2005. 'Przemiany kulturowe społeczności epoki brązu i wczesnej epoki żelaza w rejonie Środkowej Noteci' (unpublished master's thesis, Uniwersytet im. Adama Mickiewicza w Poznaniu)
——. 2006. 'Rosko, stan. 4, gm. Wieleń. Z badań nad osadnictwem kultury łużyckiej', in *Pradolina Noteci na tle pradziejowych i wczesnośredniowiecznych szlaków handlowych*, ed. by Henryk Machajewski and Jarosław Rola (Poznań: Stowarzyszenie Naukowe Archeologów Polskich), pp. 201–16
——. 2008. 'Z badań nad osadnictwem społeczności wiązanych z kulturą łużycką w północnej Wielkopolsce', *Fontes archaeologici Posnanienses*, 44: 5–16
——. 2016. *Metal — granica — rytuał: Badania nad depozytami przedmiotów metalowych w kontekście sieci osadniczej*, Archaeologia Bimaris. Monografie, 7 (Poznań: Wydawnictwo Innowacje i Nauka)
——. 2018a. 'Dynamika kulturowa wczesnych faz epoki brązu w strefie nadnoteckiej. Stanowisko Rosko 4 w perspektywie regionalnej', *Fontes archaeologici Posnanienses*, 54: 57–74
——. 2018b. 'Perspektywy badań nad skarbami z późnej epoki brązu i wczesnej epoki żelaza', *Śląskie Sprawozdania Archeologiczne*, 60.1: 279–313
——. 2019a. 'Północnopontyjski trop nad Notecią we wczesnej epoce żelaza', in *Vir Bimaris: Od kujawskiego matecznika do stepów nadczarnomorskich. Studia z dziejów międzymorza bałtycko-pontyjskiego ofiarowane Profesorowi Aleksandrowi Kośko*, ed. by Marzena Szmyt, Piotr Chachlikowski, Janusz Czebreszuk, Marcin Ignaczak, and Przemysław Makarowicz, Archaeologia Bimaris. Dyskusje, 5 (Poznań: Uniwersytet im. Adama Mickiewicza), pp. 349–55
——. 2019b. 'The Rosko Hoard – a Roadsign? Research and its Perspectives: Mass Depostion of Metal Objects, Late Bronze and Early Iron Ages in Poland', *Praehistorische Zeitschrift*, 94.1: 233–51
Mauss, Marcel. 1973. *Socjologia i antropologia*, Biblioteka Socjologiczna (Warsaw: Wydawnictwo Naukowe PWN)
Michałowski, Andrzej. 2006. 'Kultura jastorfska w Wielkopolsce północnej', in *Pradolina Noteci na tle pradziejowych i wczesnośredniowiecznych szlaków handlowych*, ed. by Henryk Machajewski and Jarosław Rola (Poznań: Stowarzyszenie Naukowe Archeologów Polskich), pp. 183–99
Mierzwiński, Andrzej. 1994. *Przemiany osadnicze społeczności kultury łużyckiej na Śląsku* (Wrocław: IAiE PAN)
Niedźwiecki, Rafał. 2005. 'Przemiany kulturowe społeczności wczesnej epoki żelaza w rejonie Środkowej Noteci' (unpublished master's thesis, Uniwersytet im. Adama Mickiewicza w Poznaniu)
Ranoszek, Włodzimierz. 2003. 'Skąd się wzięły Stawy Milickie? Uwagi na temat geograficznych warunków założenia stawów', *Dolina Baryczy*, 9: 90–104

Seger, Hans. 1936. 'Schlesische Hortfundeaus der Bronze- und frühen Eisenzeit', *Altschlesien*, 6: 85–182

Solon, Jerzy, Jan Borzyszkowski, Małgorzata Bidłasik, Andrzej Richling, Krzysztof Badora, Jarosław Balon, Teresa Brzezińska-Wójcik, Łukasz Chabudziński, Radosław Dobrowolski, Izabela Grzegorczyk, Miłosz Jodłowski, Mariusz Kistowski, Rafał Kot, Paweł Krąż, Jerzy Lechnio, Andrzej Macias, Anna Majchrowska, Ewa Malinowska, Piotr Migoń, Urszula Myga-Piątek, Jerzy Nita, Elżbieta Papińska, Jan Rodzik, Małgorzata Strzyż, Sławomir Terpiłowski, and Wiesław Ziaja. 2018. 'Physico-geographical Mesoregions of Poland: Verification and Adjustment of Boundaries on the Basis of Contemporary Spatial Data', *Geographia Polonica*, 91.2: 143–70

Sprockhoff, Ernst. 1930. *Zur Handelsgeschichte der germanische Bronzezeit*, Vorgeschichtliche Forschungen, 7 (Berlin: De Gruyter)

Szamałek, Krzysztof. 2009. *Procesy integracji kulturowej w młodszej epoce brązu i początkach epoki żelaza na Pojezierzu Wielkopolskim* (Poznań: IAiE PAN)

Tilley, Christopher. 1994. *A Phenomenology of Landscape: Places, Paths and Monuments* (Oxford: Berg)

Tobolski, Kazimierz. 1962. 'Próba określenia wieku wydm Międzyrzecza Warciańsko-Noteckiego metodą palinologiczną', *Badania fizjograficzne nad Polską Zachodnią*, 10: 233–74

Ucko, Peter J., and Robert Layton (eds). 1999. *The Archaeology and Anthropology of Landscape: Shaping your Landscape*, One World Archaeology, 30 (London: Routledge)

Vachta, Tilmann. 2016. *Bronzezeitliche Hortfunde und ihre Fundorte in Böhmen*, Topoi — Berlin Studies of the Ancient World, 33 (Berlin: Topoi)

Wheatley, David, and Mark Gillings. 2000. 'Vision, Perception and GIS: Developing Enriched Approaches to the Study of Archaeological Visibility', in *Beyond the Map: Archaeological and Spatial Technologies*, ed. by Gary Lock, NATO Science Series A: Life Sciences, 321 (Amsterdam: IOS), pp. 1–27

Wielgosz, Zbigniew. 2006. 'Pogranicze wielkopolsko-pomorskie we wczesnym średniowieczu', in *Pradolina Noteci na tle pradziejowych i wczesnośredniowiecznych szlaków handlowych*, ed. by Henryk Machajewski and Jarosław Rola (Poznań: Stowarzyszenie Naukowe Archeologów Polskich), pp. 307–27

Windholz-Konrad, Maria. 2012. 'Das Deponierungsareal bei der Rabenwand im steirischen Kainischtal in Österreich. Zum ausgeprägten Hortphänomen entlang der Traun im Alpendurchgang zwischen Zinkenkogel und hohem Sarstein', in *Hort und Raum: Aktuelle Forschungen zu bronzezeitlichen Deponierungen in Mitteleuropa*, ed. by Svend Hansen, Daniel Neumann, and Tilmann Vachta, Topoi — Berlin Studies of the Ancient World, 10 (Berlin: De Gruyter), pp. 117–50

Wyrwa, Andrzej Marek. 2006. 'Czynniki związane z procesem formowania się grodów limesu nadnoteckiego we wczesnym średniowieczu. Stan i perspektywy badań', in *Pradolina Noteci na tle pradziejowych i wczesnośredniowiecznych szlaków handlowych*, ed. by Henryk Machajewski and Jarosław Rola (Poznań: Stowarzyszenie Naukowe Archeologów Polskich), pp. 281–305

JÁNOS GÁBOR TARBAY

8. Twin Hoards and Hoard Selections from Late Bronze Age Transdanubia

▾ **ABSTRACT** The study discusses the hoard selection practices of the Late Bronze Age (Ha B1) in Transdanubia, west Hungary. The starting point of the study is two new hoards deposited right next to each other from Budakeszi-Őzvölgy-tető (Pest Co.), which were excavated by the Hungarian National Museum's Community Archaeological Programme in 2017. The main methods of the study are metalwork use-wear analysis and the statistical analysis of the typological, technological, and fragmentation patterns of metal hoards found in Transdanubia. The study aims to shed new light on the modelling of hoard selection, identification of sets of objects within the internal structure of such a deposit, and regional hoard groups that may have followed identical ritual traditions.

▾ **KEYWORDS** hoard selection, context, west Carpathian Basin, Late Bronze Age (Ha B1), metalwork wear analysis

Introduction

In the west Carpathian Basin, the region called Transdanubia occupies approximately half of the territory of present-day Hungary. The terrain of this geographical region consists of hills, basins, plains, and mountains. It is bordered by the eastern foothills of the Alps, and the Danube and Drava Rivers. There are also large freshwater bodies nearby, such as Lakes Balaton, Velence, and Fertő (Neusiedler See). This region was ideal for habitation and became densely inhabited during the Late Bronze Age, when an intense network of settlements was established (Patek 1968; Kőszegi 1988; Száraz 2017). During the Urnfield period (Br D/Ha A1–Ha B3), local communities showed strong cultural connections with the northern Balkans, the Alps, northern Italy, Moravia, and the north-east Carpathian Basin, of which the best examples can be found among the contemporary metalwork deposits. The phenomenon of metalwork deposition was most significant during the Ha A and Ha B1 periods. Numerous weapons were found in wetland areas like in the Danube River or Lake Balaton (Szathmári 2005). Also, many dryland hoards with different characteristics have been unearthed in a substantial number of natural sites and settlements since the end of the nineteenth century (Mozsolics 1985a; Kemenczei 1996).

Although this region may have been a prominent area in terms of the number of deposited metal hoards (Mozsolics 1985a; 2000; Kemenczei 1996), the same cannot be said about the number of assemblages from secure contexts. Most hoards were found accidentally

János Gábor Tarbay • Department of Archaeology, Scientific Directorate, National Institute of Archaeology, Hungarian National Museum, Hungarian National Museum Public Collection Centre (tarbay.gabor@hnm.hu)

Hoards from the European Bronze and Iron Ages: Current Research and New Perspectives, ed. by Marcin Maciejewski, János Gábor Tarbay, and Kamil Nowak, NAA, 4 (Turnhout, 2024), pp. 107–129.
BREPOLS PUBLISHERS DOI 10.1484/M.NAA-EB.5.142440

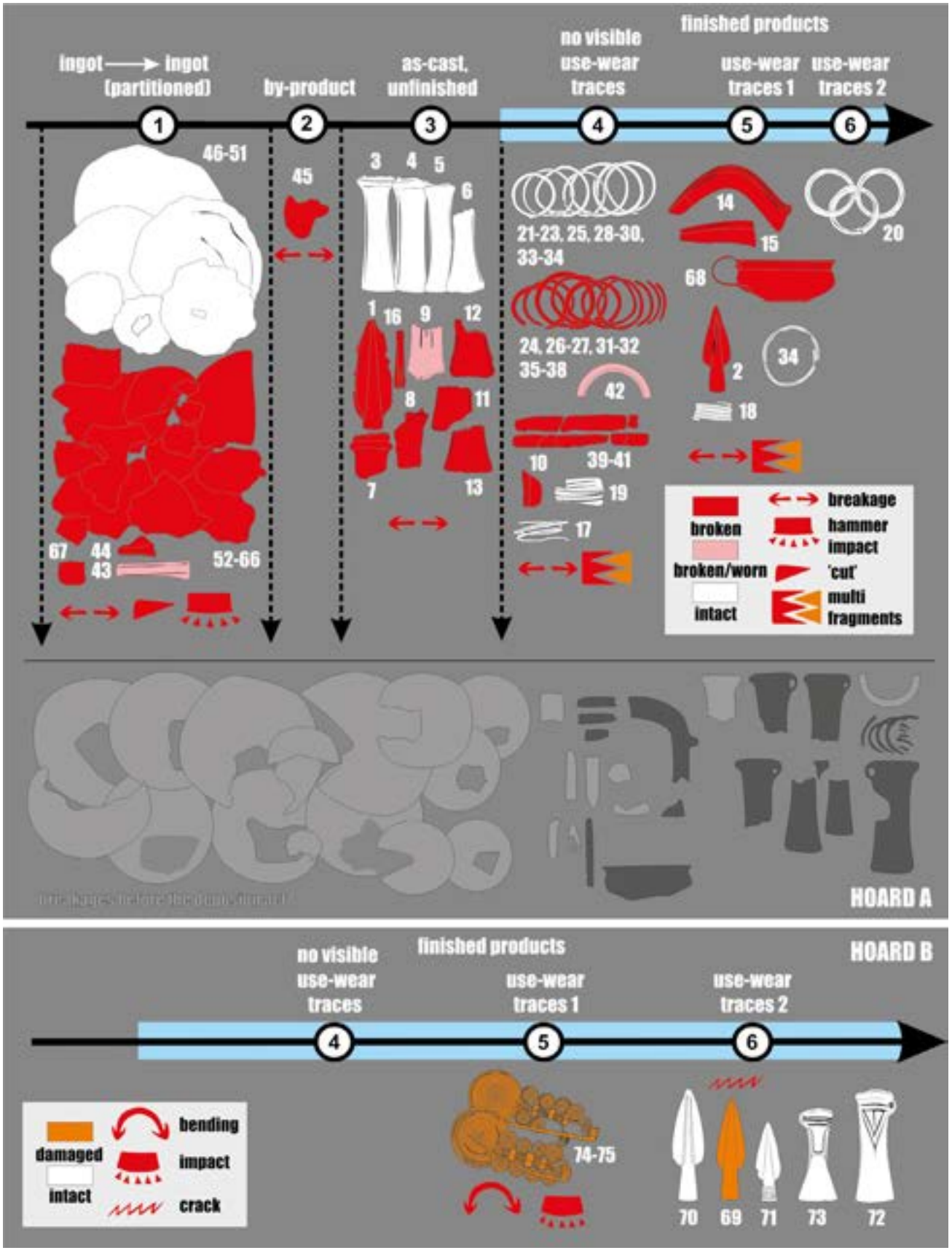


Figure 8.1. The selection of the Budakeszi A and B hoards. Graphic by author.

by locals, farmers, and workers, and they are now being looted by illicit metal detectorists. The oldest assemblage that has been excavated and documented with photos was investigated by Gyula Mészáros in 1969 at Nagyvejke (Tolna Co., Ha A1). Unfortunately, this hoard had fallen victim to agricultural work. The objects from the Nagyvejke hoard had been deposited in a pit. They were intact and broken, showing no specific organization in their placement (Mészáros 1972, 20, fig. 2). Between 2003 and 2006, twelve hoards were excavated in context by Róbert Müller in the Várvölgy-Nagyláz-hegy (Zala Co., 'Ha A2/Ha B1') hill-site settlement. According to preliminary studies released by the excavator, this was a multi-hoard site with an overly complex deposition pattern and high-quality objects. The published photos of the internal arrangement of objects in the hoards indicate that they had a layered, well-organized placing of objects that was created during the act of deposition (see Müller 2006; 2013; 2017).

Because two elite hoards were excavated in context in 2011, this was a significant year of discovery. One was excavated at Szentgyörgyvár-Felsőmánd site B (Zala Co.). This assemblage consisted of an intentionally damaged metal vessel set, a fibulae pair, and broken wagon parts, placed in a highly organized manner (Tarbay and Havasi 2019). The others were found in Pázmándfalu (Győr-Moson-Sopron Co.) by a team of metal detectorists from the Institute of Archaeology of Eötvös Loránd University. Three hoards were deposited here in an organized manner. All contained rare objects like offensive weapons, armour, or a metal vessel that were dismantled, broken, and partially burned. These were most likely funerary hoards belonging to individuals with high status who represented themselves through warrior identity and different prestige objects related to elite culture (V. Szabó 2019a, 60–71, figs 43–46).

The latest found assemblages have been unearthed in Budakeszi-Őzvölgy-tető (Pest Co.), an area in the Buda Hills that was previously unknown for hoard finds. These hoards are the starting point for the main line of thought in this paper, which aims to shed new light on the selection of components of the metal hoards from Transdanubia. Based on preliminary results, Budakeszi-Őzvölgy-tető was a multi-period hill site. Its oldest habitation is related to the Middle Bronze Age (approx. Br A2), while the dating of most metal stray finds ranges between the Ha A1 and Ha B1 phases of the Late Bronze Age. The two hoards, which were deposited in close proximity to each other, were excavated in 2017 by the Community Archaeology Programme of the Hungarian National Museum (HNM). Hoard A contained sixty-eight objects, mostly plano-convex ingots, socketed axes, rings with tapering terminals, a bronze cup, and two spearheads. On the other hand, hoard B was a much smaller assemblage comprised of just a few objects: three spearheads, two fibulae, and two socketed axes (Fig. 8.1). The relative time of deposition of these hoards was the Ha B1 period based on good parallels. The complete evaluation of the Budakeszi A–B finds is the subject of a book (Tarbay 2022). Further field surveys, archaeometallurgical analyses (Tarbay and Maróti 2023), and in-depth evaluation of the finds are in progress. In the first half of the paper, the results of the metalwork wear analysis of the contents of the Budakeszi A–B hoards, and their internal structuring will be discussed. The study will also re-evaluate some formerly found Transdanubian assemblages related to these hoards, and it will also reflect on the topic of selection of objects in Late Bronze Age metal hoards by introducing local examples and applying statistical methods for comparison.

Budakeszi-Őzvölgy-tető Hoards A–B: Selection and Context

Selection

Hoards A and B from Budakeszi-Őzvölgy-tető were found near to each other. Typologically, neither of them can be considered special. Hoard A contains two spearheads, eleven socketed axes, one awl, two sickles, two spiral bracelets, three bracelets, eighteen rings, one annular ring, one cast ring chain, one cuboid ingot, two rod ingots, twenty-one plano-convex ingots, one droplet, and one bronze cup. Hoard B consists of only three spearheads, two axes, and two fibulae. Except for a few finds, they contain common local or Carpathian types that are widespread between Ha A1 and Ha B1 (Fig. 8.1). The time of deposition of both assemblages can be referred to Ha B1, which means that they were either deposited at the same time, or not much time could have passed between their deposition. The main arguments for the Ha B1 deposition of hoard A are the relative chronological positions of the Fuchsstadt type cup (Martin 2009, 53–62; Soroceanu 2008, 50; Tarbay 2015, 44–45, fig. 12), the cast chained rings (Vorlauf 1990), and the Lovasberény/Gór type plano-convex ingots (Czajlik 2012, 68–70). The remaining finds are representative of multiple periods, but their deposition ended in Ha B1 or their selection for hoards was more common during this period. An extra argument was provided by the handheld XRF analysis carried out by Boglárka Maróti (Centre for Energy Research), whose work revealed that several of the objects from hoard A may have been of high-leaded alloys, which is a characteristic elemental composition pattern for the Ha B1 period in the west Carpathian Basin (Czajlik 2012, 97–98, 103; Tarbay and Maróti 2023). The main arguments for the Ha B1 deposition of

Figure 8.2. Selected images of the metalwork wear analysis of Budakeszi-Őzvölgy-tető, hoard A: A. sharpened knobbed sickle edge with notches, B. hammer marks related to partition, C. blade of an as-cast Palotabozsok type axe, D. worn breakage surface of a socketed axe. Photos and micrographs by author.

hoard B are the good parallels of the Debrecen type axe (Mozsolics 1985a, pl. 250.8; Vinski-Gasparini 1973, 211, pl. 108.7), the identical and loosely related finds of the pseudo-winged axe (Zoltai 1909, fig. 3; Patek 1968, pl. 31.1; Vinski-Gasparini 1973, pl. 108.10; Říhovský 1992, pls 60.868, 62.893; Kuśnierz 1998, pl. 4.57; Pászthory and Mayer 1998, pl. 70.1037; Mozsolics 2000; pl. 84.19; Jamaković 2011, pl. 11; Țerna and Topal 2013, fig. 2.13; Lauermann and Rammer 2013, pls 25.4, 27.4; Tarbay 2018, fig. 102.4, pls 34.2, 80.7, 149.1–2, 161.33, 162.38, 222.107, 245.9, 351.10, 368.2), as well as parallels and style elements of the decorated spearhead with rectangular lower blade part (Bader 2015, 382).

Essentially, these would be the conclusions supplemented with parallel lists that one can get in most cases after thoroughly analysing a Carpathian hoard. These can be taken much further if one applies the method of metalwork wear analysis. Typically, metalwork wear analysis studies have focused on a single artefact or group of artefacts (Dolfini and Crellin 2016). In exceptional cases, we can see analyses of complete assemblages. In Hungary, such an attempt was first made by Géza Szabó in 1993, who characterized the Regöly-Veravár hoard, Tolna Co. by such means (Szabó 1993; 2013).

The finds from Budakeszi-Őzvölgy-tető were particularly suitable for this kind of approach, as they originated from an uncultivated forest area and were preserved in almost perfect condition. The metalwork wear analysis of the objects was made by high-resolution photographs and a dntDigi Micromobile camera (20×–500× magnification range). I will give a summary of these results below.

The objects from hoard A can be sorted into groups based on their technological class and use-wear traces: 1. ingots; 2. by-products; 3. as-casts, semi-finished products, 4. finished products with no visible use-wear traces, 5. used objects, 6. heavily used objects (Fig. 8.1). The objects in hoard B solely belong to the category of used and heavily used specimens. In some respects, these categories are artificial, but they are the next best thing to gaining an overview. A fine example of the overlaps between these groups is the finished products without visible use-wear traces, as the lack of traces does not mean that the object could not have been used in prehistory. Multiple explanations exist for this phenomenon, like the removal of traces during maintenance, the studied fragment being unrepresentative of use wear, taphonomy effects, etc. (see Horn and von Holstein 2017).

Hoard A is dominated by raw materials and objects that were most likely treated as such, like the droplet and the as-casts: socketed axes (Fig. 8.2: C), a spearhead, and a gouge. The latter objects were also defective products, showing mismatch, porosity, shrinkage, core defects, incomplete defects, and metallic projections. A fine example is the solid cast spearhead with an extreme mismatch defect. The second group consists of finished products, ornaments, tools, and a bronze cup. Most finished products are ornaments, cast and hammered rings, arm spirals, and sheet bracelets. One of the arm spirals and a ring showed abrasion along their edges because of use. Some notches were also observed on the sickles (Fig. 8.2: A) and a spearhead (Fig. 8.1). These were probably barely used tools since they lack strong worn surfaces and repair marks. The metal cup can be considered a unique find within the assemblage as it represents an advanced and complex technology (Pietzsch 1968; Armbruster 2000, 48–58; 98–102; Hill and Putland 2014). This specimen was most likely also used, as abrasion traces can be observed along its handle. In this hoard, only one heavily used object was found: the cast chained rings (Vorlauf 1990), whose inner sides showed intensive abrasion due to friction (Fig. 8.1).

In contrast to A, hoard B consists solely of used and heavily used objects (Fig. 8.1). The fibulae pair

showed abrasion across their main discs. Spearheads have been repaired along their tips. The smallest one is a heavily used object. Its patterns showed abrasion along its socket (Fig. 8.3: A), similarly to the worn-out hilts of metal-hilted swords (Kristiansen 2002, 330, fig. 7). Also, a worn group of notches were visible along its cutting edge (Fig. 8.3: B) which may have been caused by a full-force strike during edge parrying (Hermann and others 2019, 46, fig. 4.74). A V-shaped notch, a trace related to blade-on-blade contact, was observed on another specimen (see Tarbay forthcoming). The two axes also belonged to the group of intensively used objects. The pseudo-winged axes showed worn notches along their cutting edges and vertical 'scratches' on their blades (Fig. 8.3: C). The latter phenomenon is analogous to the one observed during wood-cutting experiments by Ben Roberts and Barbara S. Ottaway (2003, fig. 8). The surface of this axe, like the larger one belonging to the Debrecen type, was worn due to heavy use. The presence of heavily used, personal objects also point to the possibility that these artefacts had specific biographies before they were deposited. During their long use-life and transformation through repair and maintenance, such objects could have accumulated several symbolic meanings or even gained their own 'personality' (Fontijn 2002, 23–36; Joy 2009; Pearce 2013).

Fragmentation, manipulation types, and their relation or disaffiliation to the hoarding act were the other questions of the analysis. Here, I will only concentrate on the discussion of prehistoric traces. Post-depositional phenomena were considered during the study, but these will be discussed elsewhere. Hoard A consists of intentionally broken and divided objects. It also contains several intact specimens from almost all technological and typological groups (Fig. 8.1). It is unlikely that all the breakages related to the act of hoarding, and it is likely that multiple causes resulted in this pattern. Like others who were involved in the technological analysis of ingots (Huth 2008, 151; Modl 2010; Nessel 2014, 405), I find it more likely that their fragmentation pattern is mainly due to their division, i.e., the result of their use as raw material for casting (Fig. 8.1, Fig. 8.2: B). Their breakage has been carried out in the bronzesmith's workshop by applying special techniques right after casting or later by pre-heating the objects to allow their division (Modl 2010). However, it cannot be stressed enough that the selection of fragmented objects, even ingots, as part of the deposition act and as symbols for complete objects or their sets, is a very plausible explanation for their presence in hoards. As-casts and defective products may have been accumulated and divided similarly to raw materials. In the case of a solid cast spearhead, breakage may have occurred after casting, as the breakages concentrate on those parts of the find which are most affected by the serious mould-flash defect. A strong argument for the pre-depositional accumulation of fragments is those finds whose breakage surfaces were worn because of constant rubbing against other metal objects: a socketed axe, a rod ingot, and an annular ring (Fig. 8.2: D). Objects were also identified whose breakage may be related to the act of deposition. These are primarily finished and used products that have been damaged, despite the fact that they were still functional at the time. These finds include a spearhead, the sickles, bronze cup, and rings and bracelets. This is also plausible for those finds whose fragments were deposited in different parts of the hoard, for example a knobbed sickle, a spearhead, and the bronze cup (Figs 8.1, 8.4). Also, emblematic examples are broken sheet metal bracelets, whose fragments were put on top of one another. Except for breakage, no special manipulation was observed on

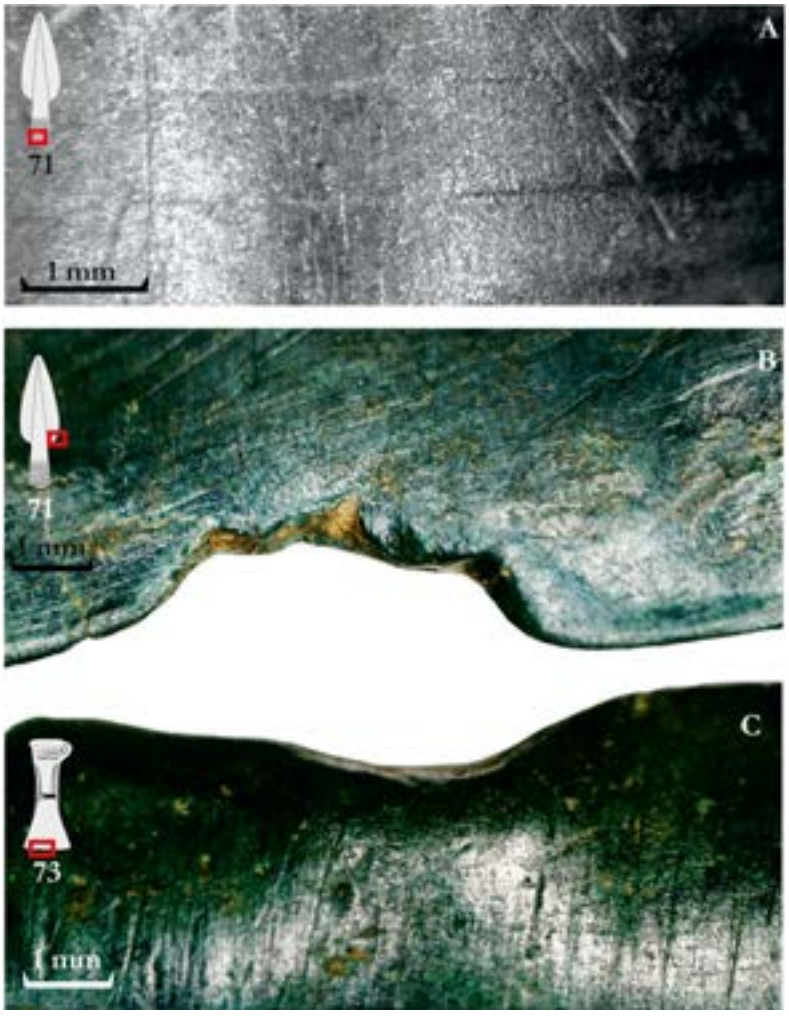


Figure 8.3. Selected images of the metalwork wear analysis of the Budakeszi-Őzvölgy-tető, hoard B: A. worn-out patterns of a spearhead, B. multiple worn notches along the cutting edge of a spearhead, C. scratches and worn notches along the cutting edge of a pseudo-winged axe. Micrographs by author.

the objects from hoard A. Extreme damage (object combinations, bending, crushing, etc.) was absent. The overall character of the breakages is quite 'economical' and macroscopically like traces caused by hot shorting (Knight 2019). Once again, hoard B is in stark contrast to hoard A because this small assemblage solely contains intact objects. Some objects only had minor damage of uncertain temporality and cause. A crack along the length of a spearhead (no. 69) could have been caused by misuse or incomplete pre-burial treatment. The crack in a fibula (no. 75) could have been caused unintentionally. Probably the bending of the other fibula (no. 74) was caused by intentional manipulation (Fig. 8.1).

Context

The importance of the Budakeszi hoards is that the above-discussed selection patterns can be interpreted within the internal structure (Fig. 8.4). During excavation, the exact location of all finds was documented, which allowed the reconstruction of the order in which the objects were placed in these hoards.

Hoards A and B were found approximately 11 cm from each other, which is very close indeed, and some may argue that they should be treated as one assemblage. However, metalwork wear analysis of the objects revealed that they are two separate entities with potentially different symbolic meanings based on their selection, even if they were deposited at the same time. At the find-spot of hoard A, we found no traces of prehistoric pits, cultural layers, ceramic, or organic containers. The position of the objects in this assemblage generally represents the original placement of objects. The taphonomy effect was minimal, caused by the overgrown roots of a large tree in the vicinity of the hoard and the natural erosion of the site. During the fieldwork, we observed large white stones in the sondage, which seem to be connected to the deposition of the finds as the metal objects were placed around or above them. The bottom of the hoard was *c.* 23–24 cm below the surface (Fig. 8.4).

The position of the objects deposited in hoard A was horizontal in almost every case. The objects were packed on top of each other in layers (see Soroceanu 1995, 35, 41, 45). The finds were also deposited around and on a central white stone. Some (a miscast spearhead, three as-cast socketed axes, and a broken ingot) were found under other white stones (Fig. 8.4). The clarification of the connection between the stones and the deposited objects is a task for future excavation. The results of the first fieldwork supported the hypothesis that the stones do not belong to the structure of any building. The lowest layer of the hoard consisted of large plano-convex ingots, miscast axes, and a pair of rings with tapering terminals. Also, part of a broken and used knobbed sickle was leaned against the central white stone at the northern corner of the excavation trench. A broken spearhead and a droplet were placed on this stone. The half-broken metal cup was carefully separated from the rest of the finds and placed beside the main heap of stones. Further objects were placed on the main heap that surrounded the central white stone. Of them, we can count intact and fragmented plano-convex ingots, a broken annular ring, another pair of rings with tapering terminals, and a ribbed sheet metal bracelet. Two sickle fragments were also found. One turned out to be part of a knobbed sickle leaned against the central white stone. In the main heap, at least two additional layers can be differentiated; one consisting of axes, axe fragments, plano-convex ingot fragments, and the heavily used chained rings; the other consisting of a broken rod ingot and the tip of a spearhead, of which another part was found on the central stone. The uppermost found objects were ingot fragments, two heaps of rings with tapering terminals, a small broken sheet, and metal bracelets placed inside one another. A spiral arm ring, probably the pair of the first found objects, a droplet, and a gouge fragment was also found here.

The main characteristics of the placement of groups of objects are that heavy ingots and their fragments tend to be selected in the lowest layers of the hoard, while as-cast and defective products tend to be in the upper part of the hoard, or are found beside it. Several of them were placed together with ingots. Based on the position of these finds and their technological character, one can raise the possibility that the ingots and the as-casts composed one set, in the sense of a specific group of related objects. This assumption is strengthened by the position of the finished products. With a few exceptions, they are segregated and typically concentrated at the top. The fact that rings and bracelets were tightly packed on each other suggests a close relationship between these finds and probably refers to sets. This is highly likely in the case of the rings with tapering terminals, as both heaps contained six objects. A similar way of placing rings is not an unknown deposition phenomenon. The geographically closest examples can be found in the Kesztölc-Bodzás-dűlő (Komárom-Esztergom Co.) hoard, where identical types of rings were placed in two heaps (Fig. 8.6). I am also aware of Late Bronze Age hoards from east Hungary, Austria, Moravia, and Germany where heaps of rings were documented in context (Hagl 2008, pl. 2.2–4; Vích 2012, figs 22, 24; Tarbay 2017, fig. 8; Dzięgielewski and others 2019; V. Szabó 2019a, figs 104, 120). An odd inhumation 'burial' from Ivanovice na Hané, Moravia, Czech Republic (Parma and others 2018, 324–34, fig. 4) should also be emphasized regarding the Budakeszi hoard A's

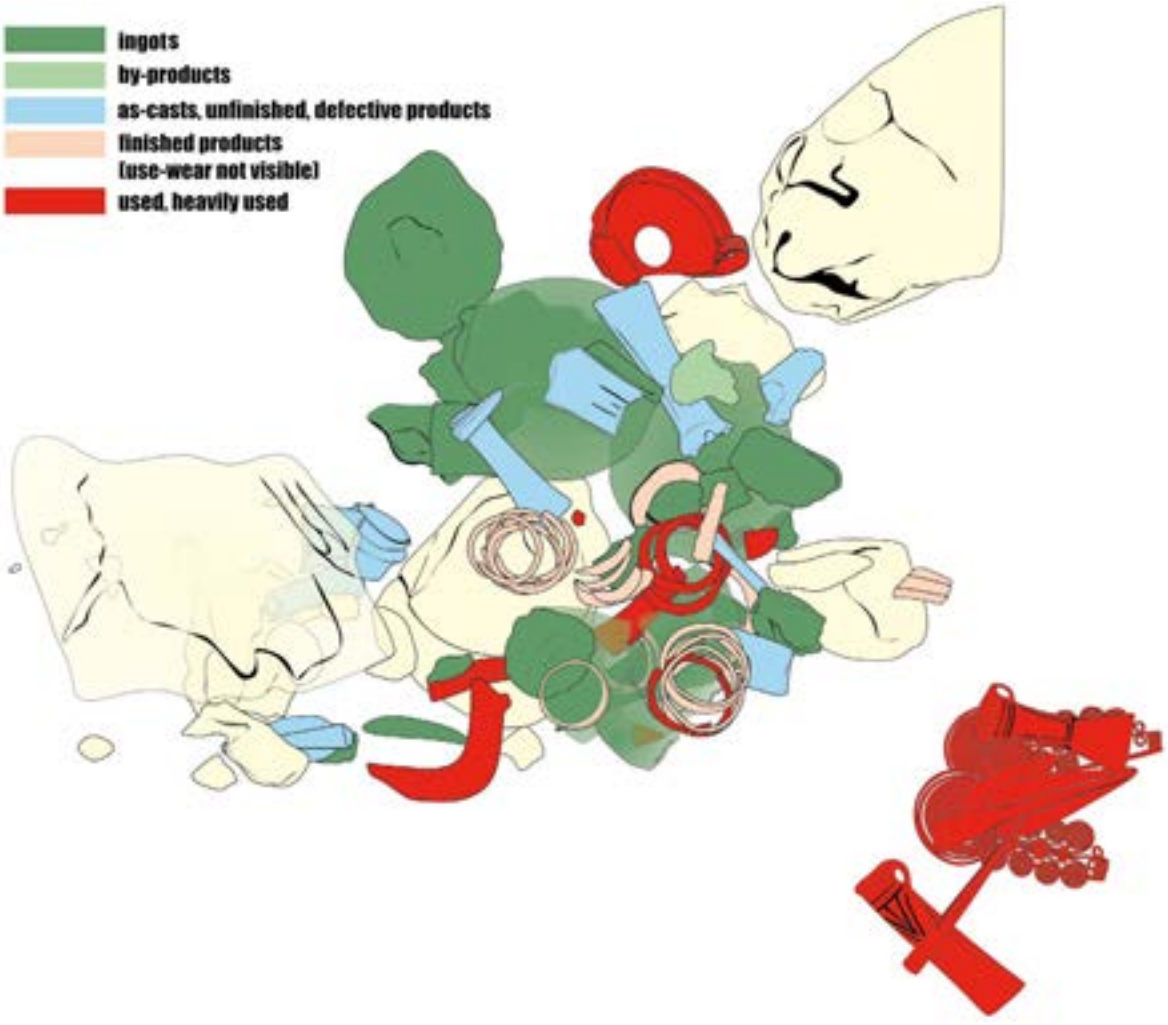


Figure 8.4. Metalwork wear analysis and context, Budakeszi-Őzvölgy-tető hoards A and B. Graphic by the author.

rings. Here the same type was found on the forearm of the deceased in a set of five. In essence, based on the position and technological type of the objects, probably the raw material stock was deposited first. There could be a minimal arrangement in this set; the ingots and as-casts were stacked on top of each other. Their position was not relevant; only the axes were concentrated at the top of the hoard. On the lowest level, a deliberately broken bronze cup was placed next to the set of raw materials. The intentionally broken used spearhead and knobbed sickle are found next to the central white stone. The tips of these objects were placed in the central pile. Eventually, sets of rings were placed on top of the main heap. During the act of hoarding, only a few breaks could have occurred. This damage, representing intentional destruction included the multi-fragmentation of the used spearhead and the sickle, the tearing apart of the cup, and the breakage of some finished products and ornaments (Fig. 8.4).

The lowest layer of hoard B consisted of two large fibulae; one's main spiral was slightly positioned on the other. Both fibulae were placed bottom up; one was closed, while the other was open. There can be no doubt that the fibulae are a pair, as they belong to the same subtype, and their manufacturing technology, size, and use-wear traces are completely identical. A few centimetres towards the northern corner, a large, socketed axe was found. A richly decorated, heavily used spearhead with a leaf-shaped blade was placed between the pin clasps of the two fibulae. On top of this spearhead and the fibulae, two other spearheads and a socketed axe with pseudo-rings were found. Unlike in hoard A, the position of objects seems to matter in this case. The typologically identical objects faced roughly the same directions. Similar spearhead placement can be found in the Pázmándfalu II, Győr-Moson-Sopron Co. (Ha A1), and Mátraszőlős-Kerekbükk, Nógrád Co. (Ha B1) hoards (Szabó 2019a, figs 46, 130–31). We can observe

the phenomena of horizontal positioning and layered deposition again. In the case of hoard B, the presence of set-like combinations is also highly likely (e.g., fibulae, spearheads, axes). It must be noted that hoard B was found at the same depth as the bottom of hoard A (Fig. 8.4).

In sum, the selection patterns of the Budakeszi hoards suggest that two assemblages were placed during Ha B1 at the same time, or not long apart. In several respects, the two hoards have different characteristics. Differences can be observed mainly in technological character and treatment of the finds in the two hoards. On the one hand, hoard A is a large assemblage containing diverse objects, dominated by a raw material set, ornaments, and object sets. Most objects are broken, and divided, but these intentional breakages reflect different temporalities. Nevertheless, a small set-like hoard was placed in the vicinity of hoard A. It consists of used and heavily used finished products (weapon-tool-ornament) which were barely manipulated, or not manipulated at all, and placed in an organized manner (Figs 8.1–8.4).

A Lost Transdanubian Hoarding Pattern

In the case of the Budakeszi hoards, it was possible to observe a relationship between the place of the objects and their technological class. Basically, one can identify sets within these hoards when the results of metalwork wear analysis are interpreted within the excavated context. Hoard A contains a large set of raw materials (ingots, by-products, as-casts, defective products) and small sets consisting of finished and used products, mainly rings. The spatially differentiated hoard B also has a number of similar characteristics. It consists of heavily used objects with potentially special biographies that may have been in the possession of one or two individuals (Figs 8.1, 8.4).

It is hard to compare this pattern to other Ha B1 Transdanubian finds due to the general lack of well-documented contexts. However, there is a hoard from Kesztölc-Bodzás-dűlő (Komárom-Esztergom Co.) found approximately 33 km north-west from Budakeszi

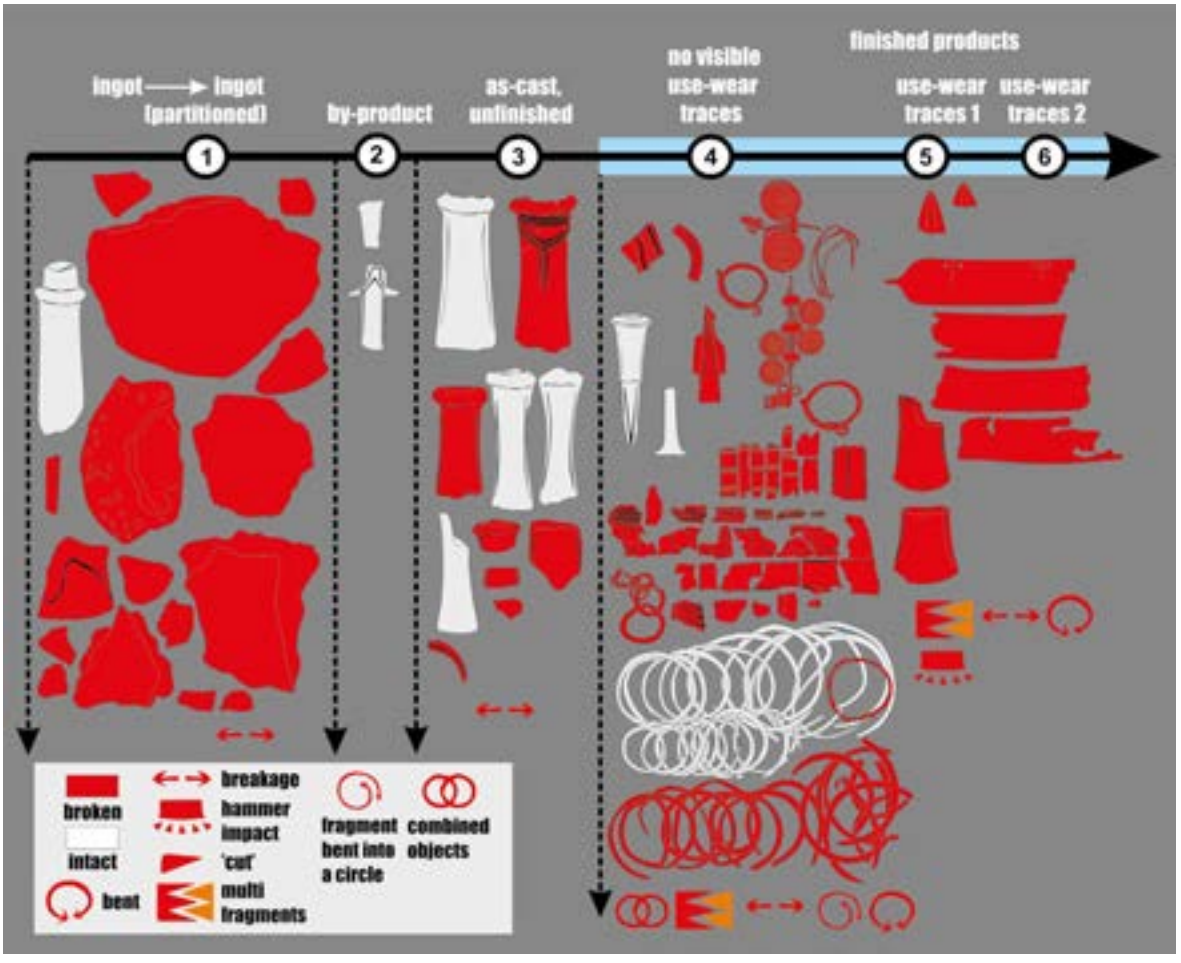


Figure 8.5. The selection of the Kesztölc-Bodzás-dűlő hoard. Graphic by author.

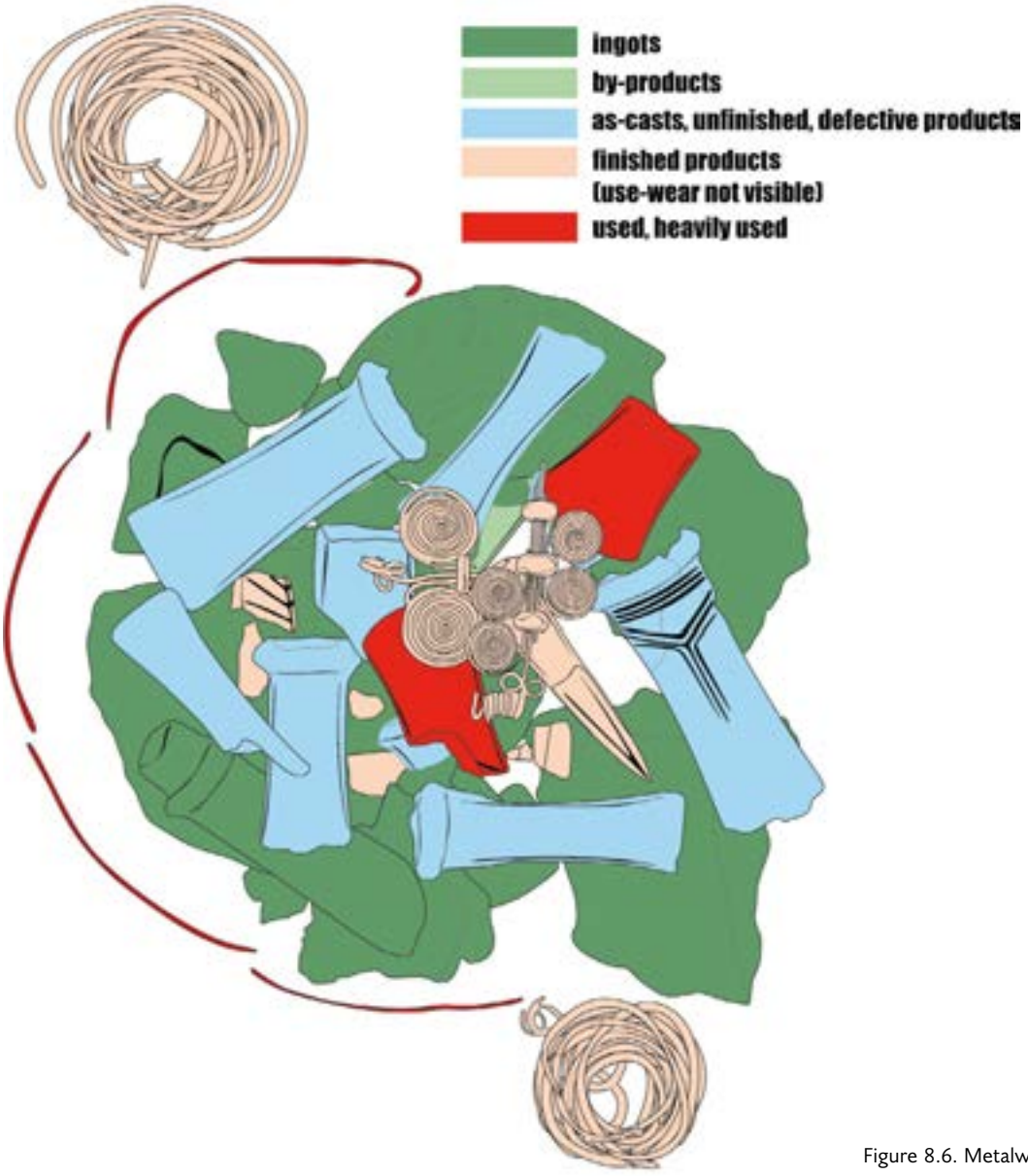


Figure 8.6. Metalwork wear analysis and reconstructed context, Kesztölc-Bodzás-dűlő. Graphic by author.

whose reconstructed internal structure seems quite similar (Tarbay 2014). This hoard basically consists of the same components. Most objects belong to a set of raw materials, comprising primarily plano-convex ingots and some special ingots, by-products (two casting jets), as well as as-cast and miscasts (Palotabozsok and Debrecen type axes, and a ring). The rest are finished products, predominantly ornaments (rings with tapering terminals), and a few tools and weapons. Some of them even showed traces of use (Fig. 8.5). The placing of the objects shows roughly the same concept as the Budakeszi finds (Fig. 8.6). This hoard was also deposited in layers, and the individual objects were found in a horizontal position. The main heap of the hoard consists of two parts. Its main heap consists of large broken ingots, on which as-cast axes, a few finished product axes, and a finished product chisel were placed. On the top of the hoard, a fibulae pair was deposited. The main heap was surrounded by the four broken fragments of the valuable sheet belt and two heaps of rings organized in a manner based on their size (Figs 8.5–8.6). The reconstructed internal structure of the Kesztölc hoard suggests that arranging the objects into sets during deposition, which can be observed in the case of the Budakeszi hoards (Fig. 8.4), was not a unique phenomenon, and it may have been a more widespread deposition trend. It should

also be emphasized that the similarities between the selection and placing of objects in the Kesztölc and the Budakeszi hoards raise the possibility that they may have been deposited by the same community or people. Examining the relationship between these hoards will be the subject of future research.

Some Local 'Twin Hoards'

The significance of the Budakeszi assemblages is that hoards deposited near to each other were previously known in Transdanubia only from examples where the internal structuring was not known or disturbed. When these hoards were discovered, their contents were typically mixed, and publishers could only, in exceptional cases, determine which objects came from which hoard. Since the hoards' circumstances of discovery were, in most cases, unknown, the possibility should not be ruled out that the phenomenon of 'twin hoarding' (or dual hoards, see Soroceanu 2011) may have been much more common in this region. Below, three Transdanubian (Nagydém A–B, Pázmándfalu) and one east Hungarian (Hódmezővásárhely) examples will be introduced and compared to the Budakeszi hoards.

One of the oldest-known Late Bronze Age examples from Transdanubia are the hoards from Nagydém-Gerhadűlő, Veszprém Co. These assemblages were found on 19 June 1892. Since their first publication, they have typically been discussed in the literature as a single hoard. In fact, at least 128 bronze objects were found in two separate pots placed next to each other. Thus, the content of the 'Nagydém hoard' was intentionally separated during hoarding. The concept of separation is unknown since the context of deposition is undocumented. Besides a handful of finished products, the main component of these hoards is a set of raw material items that, furthermore, remained technically unpublished until 2018 (Tarbay 2018, 590–94, pls 201–23). It consists of ninety-three intact and divided plano-convex ingots; two cuboid ingots; two rod ingots; one double-axe ingot; four divided miscast and as-cast socketed axes, and an as-cast sickle. Not only were there a considerable number of the plano-convex ingots, but they are altogether quite heavy (56,929 g). The weight of the largest pieces is between 5561 and 1051 g, while the smallest ingot fragment is only 21 g (Fig. 8.7). These were found with three, intentionally broken, east Carpathian metal-hilted swords, a spearhead, finished product sickles, and axes. Among the preserved specimens, five showed use-wear traces. At the same time, edge damage was visible on a socketed axe and two sickles. The two swords had worn hilts except a few, mainly large and heavy ingots. The raw material set was deposited in a fragmented state, showing hammer impacts in the middle of the plano-convex ingots, and cut marks made in a half-melted state (see Modl 2010). Technically, all division shapes and dimensions of the plano-convex ingots can be found in these hoards (Nessel 2014, fig. 1). Rod ingots, cuboid ingots, and double axe ingots were also selected in a fragmented state. The as-casts were broken, too. Some of the finished products were deposited in an intact state, like the spearhead and the sickles, while others were fragmented intentionally. Good examples of the latter are the three metal-hilted swords, in which only their upper parts were selected. The exact relative chronological pattern of these mixed hoards may remain a mystery forever. The parallels of the selected objects ranged from Br D/Ha A1 to Ha B1/Ha B2. Based on in-depth analysis of its content, I find it more likely that the Nagydém hoards may have been deposited around the same time as the ones from Budakeszi in the Ha B1. The Nagydém hoards are difficult to interpret due to a lack of context. Solely based on the selected objects, these assemblages show representation by quantity and quality. The symbolic message of these hoards is clearly coded into the raw material set or sets. The depositors practically had access to all kinds of raw materials, even 'exotic' ones (e.g., double-axe ingot) and obviously in a large quantity, which is proven well by the *c.* 56 kg total weight of these sets, which is most likely only a 'small' part of the original stock of raw materials from which they have been carefully assembled. The minor hoard components reflect quality. The intentionally broken east Carpathian metal-hilted swords, the unique sword pommel, and finds that may have been part of an exclusive wagon, such as the bird-headed rivets or the disc-headed tubes, are excellent examples. In my opinion, the Nagydém assemblages could have been a unique elite hoard, a *pars pro toto* of selected belongings of the members of a wealthy local household intended to reflect 'unlimited' access and control of raw materials through a votive act. The most striking similarity between the Nagydém finds and Budakeszi hoard A is the raw material set, which is identical regarding its selected types, the ratio of objects, and their technological classes. The ratio of finished products is also similar between these finds (*Archaeologiai Értesítő* 1892, 383–84; Hampel 1893; 1896, pl. 195; Mozsolics 1985a, 152; Tarbay 2018, 590–94, pls 201–23) (Fig. 8.7).

The second example are the three Pázmándfalu (Győr-Moson-Sopron Co.) hoards, which were also excavated by the ELTE IAS research team, allowing their internal structure to be observed. After preliminary studies, the hoards were published in 2019 by Gábor V. Szabó (V. Szabó 2019a, 60–71; 2019b, 174–83). The three hoards consist solely of finished products, with or without observable use-wear traces. The deposited objects were intentionally damaged by breakage and bending. Some of the objects were partly melted due

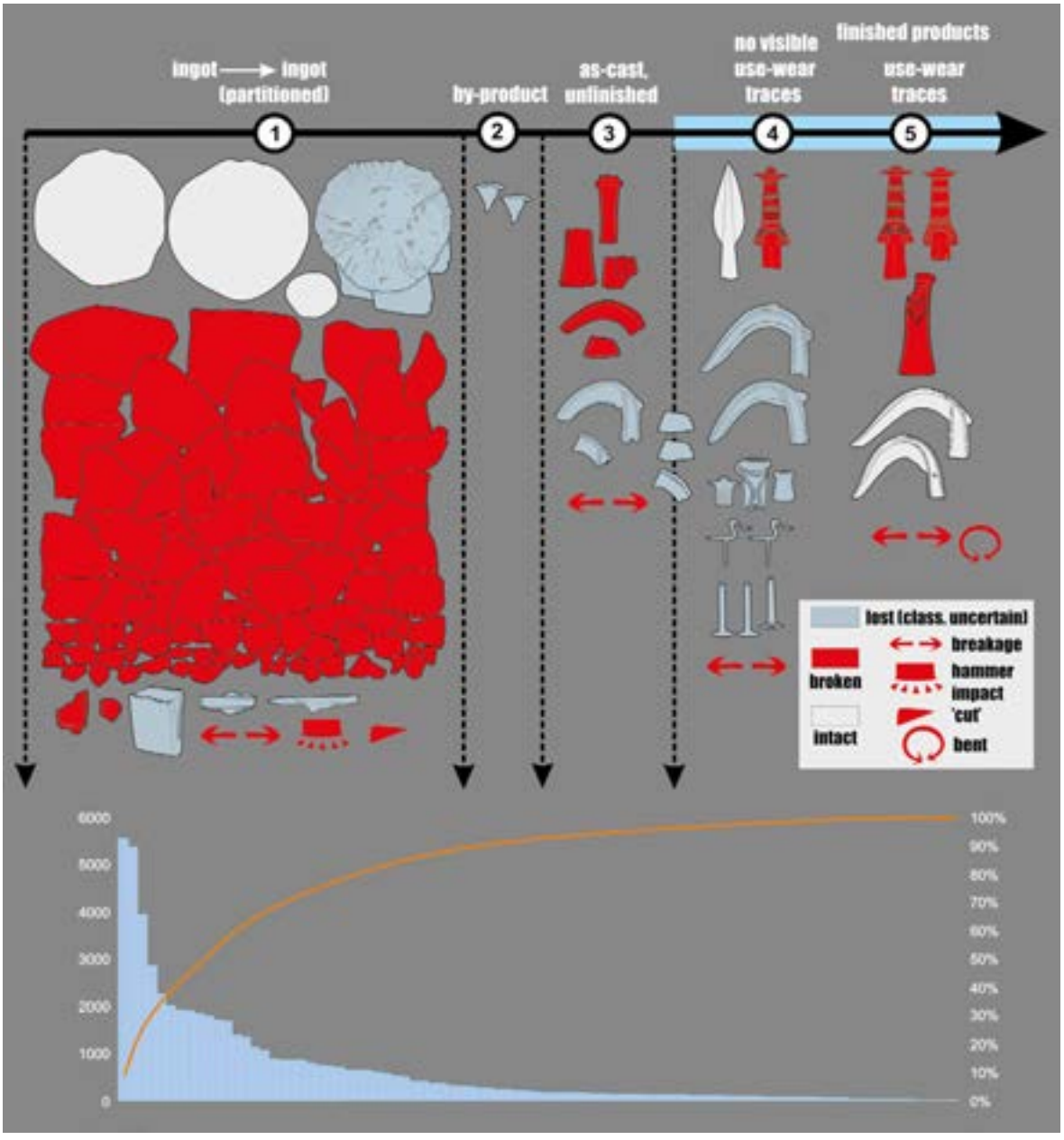


Figure 8.7. The selection of the Nagydém-Gerha-dűlő hoards. Graphic by author.

to intense heat damage. Like the Budakeszi hoards, the finds from Pázmándfalu were also organized into sets during the act of deposition. In this case, the distance between the hoards is greater (3 m between the first and second, and 8–10 m between the third and the other two). Hoard no. 1 consisted of numerous small finds, mostly ornaments, rivets, armour pieces, metal vessels, a helmet, winged axes, and different wire objects. According to V. Szabó, they were intentionally dismantled parts of larger ornaments or a 'chariot/wagon'. Deliberately organized placement of objects was observed in the case of the second hoard, which consisted of two swords, one placed horizontally, the other bent, four used spearheads, a large knife, and a chisel placed on the top and beside them. On the top of the heap, burnt and broken cuirass fragments were found. The third hoard contained an intentionally fragmented sword, spearhead, arrowhead, knives, and ornaments. Gábor V. Szabó pointed out that the content of these funerary hoards strongly represents elite warrior identities. According to him, based on the similarities of their content and some matching fragments from both assemblages, the first two hoards were deposited at the same time. He interpreted the

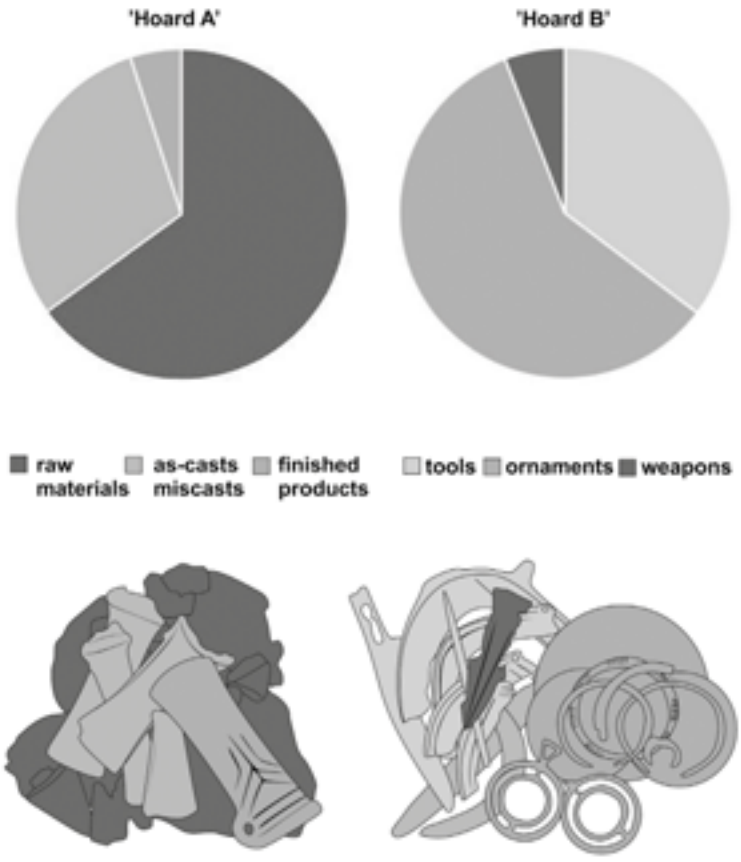


Figure 8.8. The selection of the Hódmezővásárhely-Fehértó hoards. Graphic by author.

deposition of the third hoard as an independent event (see V. Szabó 2019a, 60–71, figs 43–48; 2019b, 174–83, figs 13–17). The Pázmándfalu assemblages are chronologically older (Ha A1) compared to the Budakeszi A–B hoards, and they represent a different hoard tradition practised in Transdanubia that may have existed between the Ha A1 and Ha B1 periods (Tarbay 2015; 2020a). Similarities between these assemblages can be observed in the set-like placing of objects, the manipulation of matching fragments in space, and the deposition of heaps. The Pázmándfalu hoards are also good examples of differences in hoarding time, as two are contemporary (first and second), while the third may have been deposited nearby later.

The last, south-eastern Hungarian example is a somewhat similar 'twin hoard' to the Budakeszi finds. This was found by Sándor Rácz, a herdsman, on the bank of the Fehértó (White Lake) on the border of Hódmezővásárhely (Csongrád-Csanád Co.). At the time of its discovery, the lake had dried out after flooding. According to the finder, the objects were originally part of two hoards, which were found a 'few steps' from each other. The 'lumps' and axes consisted of one heap (hoard A), while the rest of the finds were deposited in another one (hoard B). János Banner originally questioned the credibility of this statement, but considering the Budakeszi finds, it may have been close to reality (Banner 1942, 147–50; 1945, 33–35, pls 13–14; Mozsolics 1985a, 128, pls 255–56; Tarbay 2018, 531–33). The two hoards show differences in their selection. Hoard A seems to be a pure raw material assemblage, dominated by ingots and mostly as-casts, and miscast axes. Hoard B contained broken and intact finished products; tools (a knife, sickles, awl), ornament sets (rings, pendants, phalerae), and two as-casts (Fig. 8.8). As the objects were originally part of two mixed assemblages, their typo-chronological analysis is uncertain. The majority are related to Br D/Ha A1. There is also an object that is incongruent in such a timeframe, a small crescent-shaped pendant that is more characteristic of Br B2/Br C (Jankovits 2017, 199–211; Tarbay 2018, 531–33, pls 100–05). The youngest finds are socketed axes and an annular ring that date the deposition of these hoards to roughly the same period, the Ha B1. These contemporary finds contained intentionally separated sets; hoard A was an approximately 5.5 kg raw material set that, in a way, reminds us of its Transdanubian counterparts. Hoard B was dominated by ornaments, tools, and a weapon. These discoveries are not unique in terms of technology or typology; however, the selected finished products may have had personal symbolic value (Tarbay 2018, 531–33). This concept is best illustrated by the chronologically incongruent crescent-shaped pendant that may have been inherited for generations before it was surrendered through a votive act. The Fehértó hoards are fine analogues of the spatial separation of two contemporary hoards containing different sets, a concept that is also observable in the case of the Budakeszi finds.

The examples show that there was no singular reason behind the formulation of local 'twin hoards'. Such assemblages could have been deposited at the same time as part of one act. It is likely that when hoards are separated into heaps, the hoarding act was performed by more people. The spatial separation of heaps (hoards) is clearly deliberate and symbolic. It can be assumed that each heap (hoard) symbolizes a particular depositor or group of depositors. The separation of objects into layers and sets may also have the same role. Another scenario is that the second or third hoard was deposited later at the same or nearby location. In these cases, the new hoard was placed in a mental space that was well known to the depositors (e.g., Pázmándfalu III). A fine local example is the high-altitude settlement of Várvölgy-Nagyláz-hegy (Zala Co.), where the hoards were deposited relatively close to each other. In this case, the hoarding act took

place in the space of everyday life. The location of these, sometimes highly representative, assemblages were probably known to several people (Müller 2006; 2013; 2017). Layered hoards can also be evidence of later deposition. If one follows this idea, it would mean, for instance, that the group of rings in Budakeszi A hoard was deposited much later than the assemblage of raw materials. In this scenario, depositors enlarged the core heap by adding more elements. The new sets are always clearly separated from the previous hoard, either horizontally or vertically. This would mean that a hoard assemblage has accumulated for a long period, and there is a connection between the different hoarding acts: either the depositors are related (e.g., same family, same community, etc.), or the aim of the ritual is common. This is more plausible in the case of large multi-period hoards.

A Transdanubian Selection

The question of how to interpret the composition of the Budakeszi hoards within the context of local hoarding trends may arise. Are they one-of-a-kind discoveries, or can they be linked to previously discovered assemblages? Late Bronze Age metalwork deposition in the Carpathian Basin seemingly shows close connections, but it differs at the regional and chronological level (Mozsolics 1985a; 2000; Hansen 1994; Kemenczei 1996). The main boundary, naturally with overlaps, is between the eastern and western parts of the Carpathian Basin, which can be observed in cultural trends, styles, and, of course, metalwork deposition practices. Therefore, the selection patterns of the Budakeszi hoards can be best compared to those of the Transdanubian material.

For comparison, I chose those Transdanubian hoards whose relative time of deposition is Ha A2/Ha B1, Ha A–Ha B1, or Ha B1 (see Mozsolics 1985a; 2000; Kemenczei 1996; Müller 2013; Ilon 2015; Tarbay 2018; 2020a; 2020b). I believe that these hoards were all deposited around Ha B1, partly in agreement with Hansen (1994; 1996), but they cannot be described more precisely (Ha A2/Ha B1, Ha A–Ha B1) given the current state of the local Late Bronze Age relative chronology (see Tarbay 2018; 2020b). The method of comparison was partly a correspondence analysis made using the Past software. The main questions of the comparison are the typological and technological composition and the ratio of fragmentation.

Typological Selection

The studied hoards have different characteristics. Most of them contain diverse objects, like the Budakeszi A find. Essentially, these are the assemblages that I intend to examine (thirty-three hoards): Badacsonyomtaj; Balatonfenyves; Bátaszék; Biatorbágy; Budakeszi A–B; Beremend; Csabdi; Gyermely-Szomor; Jobaháza; Keszőhidegkút; Kesztölc; Lesenceistvánd II–III; Lovasberény; Máriakéménd; Meszlen; Nagydém A–B; Nagydobsza; Oroszlány [Bokod]; Sárbogárd; Sümeg; Sióagárd-Leányvár; Somogyszob; Szombathely; Székesfehérvár; Tatabánya I–III; Torvaj; Velem Ia–Ib. During the correspondence analyses, unique hoards were not included. These are the pure or almost pure gold hoards e.g., Várvölgy-Nagy-Lázhegy I–II, Zala Co., Velem ornatus hoard, Vas Co. (Tompa 1928; Müller 2013; Ilon 2015) that belong to a supraregional hoarding pattern including the eastern Alpine region (Mozsolics 1950; Müller 2013; Ilon 2015). The feasting set hoards of Sümeg (Veszprém Co.) and Várvölgy-Nagy-Lázhegy (Zala Co.) were omitted (Patay 1990, 33, 80, no. 42A, pls 27.46A–B, 36.69A, 64.144, 65.145, 66.145A). The lavish elite hoard from Szentgyörgyvár-Felsőmánd (Zala Co.) was also not included as it has a completely unique composition (two fibulae, four bronze vessels, and two wagon parts) in the framework of the Transdanubian finds (Tarbay and Havasi 2019). It may be best related to the unpublished finds from Várvölgy-Nagy-Lázhegy that were also left out (Müller 2006; 2013; 2017). Tatabánya A, Komárom-Esztergom Co. (Tarbay 2020a) was also excluded from the typology-based correspondence analysis due to the small number of selected artefacts and their unique composition. I also included the 'Sárszentmiklós' hoard, which was identified as Sárbogárd-Sárszentmiklós (west Hungary, Fejér Co.) by Tibor Kemenczei (Kemenczei 1996, 55; Váczi 2013, 289–90) and Nagyrábé II-Sárrét-Szentmiklós (east Hungary, Hajdú-Bihar Co.) by Amália Mozsolics (Mozsolics 2000, 60–61) to see to what extent this assemblage is related to other Transdanubian hoards. In general, it fits the Transdanubian material from a technological and fragmentation point of view. It only differs typologically from the rest of the finds, which rather supports Mozsolics's interpretation. Unclassifiable fragments were not counted, and some of the functionally related types were merged, for example special tools (hammers, chisels, awls, ambos), special ingots (rod, double-axe ingots/triangle/cuboid/oval/loaf-shaped ingots, half forms, individual ingots), wagon/horse (cheekpiece, disc-headed tube), fibulae/pins, feasting sets (cauldrons, situla, cups, hooks), armour (helmets, shields), rings/bracelets, phalerae/knobs, tweezers/razors, sheet/spiral tubes, rivets/pegs, knives/daggers. Ceramic pots were not analysed either, as they were the containers and not the content of these hoards (Fig. 8.9).

Regarding the typological selection of the studied hoards, one can observe groups and overlapping

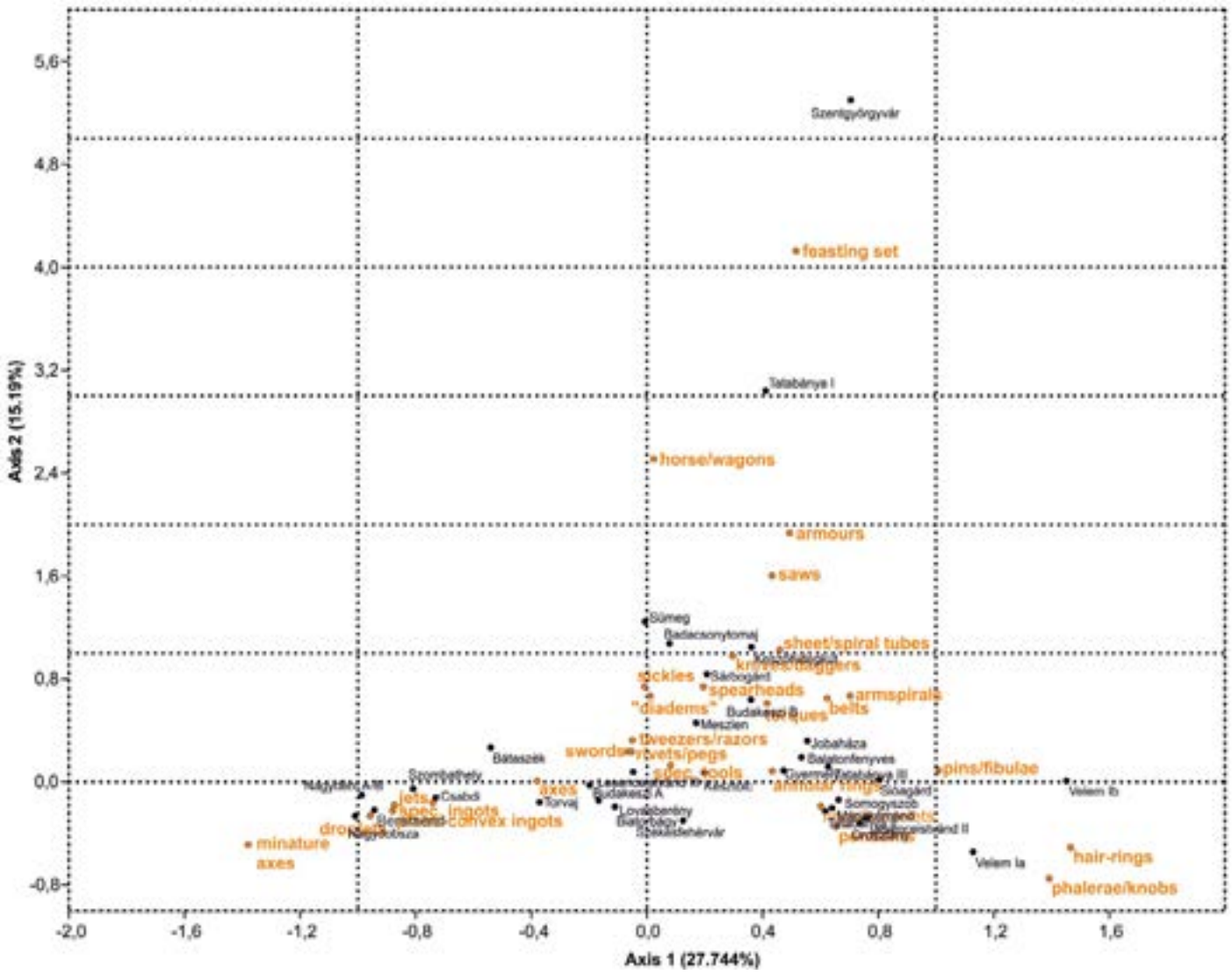


Figure 8.9. Correspondence analysis of the typological content of Ha A2/Ha B1, Ha A–Ha B1, and Ha B1 hoards from Transdanubia. Graphic created using Past by author.

categories. A well-defined group are those hoards that have been previously described as 'workshop hoards' by Hungarian researchers (Hampel 1896, 185; Mozsolics 1985b). These assemblages are dominated by plano-convex ingots and usually contain different types of special ingot. They also comprise by-products of casting, such as casting jets and droplets. Hoards containing many ornaments form another group. These assemblages are usually dominated by rings with tapering terminals (Lovasberény type), or different bracelets, e.g., Tatabánya II–III, Komárom-Esztergom Co. (Kemenczei 1983; Jungbert 1986). Some ornament hoards seem to be different, as they contain less common ornament types, e.g., Velem Ib, Vas Co (Hampel 1896, pl. 241). Those finds that contain both main hoard components in a relatively equal ratio (e.g., Kesztölc, Komárom-Esztergom Co.; Székesfehérvár, Fejér, Co.) appear between hoards dominated by ornaments and those characterized by a raw material assemblage (Petres 1960; Tarbay 2014). A sort of third, loosely related group comprises those finds that are rarely or never present in the other groups (e.g., armour/defensive weapons, knives/daggers, saws, bronze vessels). The Budakeszi A hoard is related to those finds that contain a relatively equal ratio of ornament and raw material sets. Its composition is most similar to that of the Lovasberény hoard, Fejér Co. (Mozsolics 1985a, 144–45; Tarbay 2018, 566–80). Budakeszi B is a unique assemblage, partially related to ornaments with hoards and showing a relationship with those finds that can contain spearheads and axes (Fig. 8.9).

Technological Selection

Only those hoards (twenty-seven hoards, 2651 artefacts) were included that I was able to study personally before the end of the study (see Tarbay 2018; 2020a; Tarbay and Havasi 2019). I also left out the lost assemblages and hoards in which a significant number of objects have gone missing. There are essentially five technological groups. Some of these were merged with minor related subgroups. Three of the groups (Group 1 ingots, Group 2 by-products, Group 3 as-casts, semi-finished products, and miscasts) are related to metalworking and can be defined as raw material assemblages from a technological point of view. By-products (jets, droplets, and miscasts) were collected and recycled. The as-casts and semi-finished products are also closely related to this group, as they have no standard use-life after casting. They were probably accumulated in the workshops and taken out for deposition later. A raw material component can appear in four ways in the studied hoard. It can be represented by one object, like the loaf-shaped ingot from the Oroszlány [Bokod] hoard, Komárom-Esztergom Co. (Mozsolics 1985a, pl. 232b.5). Raw materials can compose minor or major assemblages (or sets) within the hoards. For a minor set, the droplets and jets in the Gyermely-Szomor hoard (Komárom-Esztergom Co.) (Mozsolics 1985a, 121–22; Tarbay 2018, 522–27, pls 91.78–79, 92.80–87) may be the best examples, while a major set can be found in the Budakeszi A and Lovasberény hoards (Fejér Co.) (Mozsolics 1985a, 144–45; Tarbay 2018, 566–80, pl. 181.202–05, 207–18, pls 182–88) beside finished products. It is important to note that hoards with minor or major raw material sets contain finished products in similar or even larger ratios. The types of these objects are varied; they can be specialized tools (hammers, etc.), axes, or in some cases, weapons. The dominant types are undoubtedly the rings and different ornaments. The last category encompasses the purest raw material set hoards like the ones found in Nagydobsza, Beremend, Csabdi, Szombathely, Nagydém A–B (Mozsolics 1985b; 1985, 95–96, 107, 152; Ilon 2004, pls 28–50; Tarbay 2016; 2018, 494–97, 590–94, 619–25, 652–65, pls 37–43, 202–23, 256–73, 320–48). These assemblages have regular sets, both typologically (see below) and technologically as well. They comprise mainly ingots (many plano-convex ingots, few rod ingots, cuboid ingots, triangle-shaped ingots, double axe ingots, individual ingots, axe/ring-

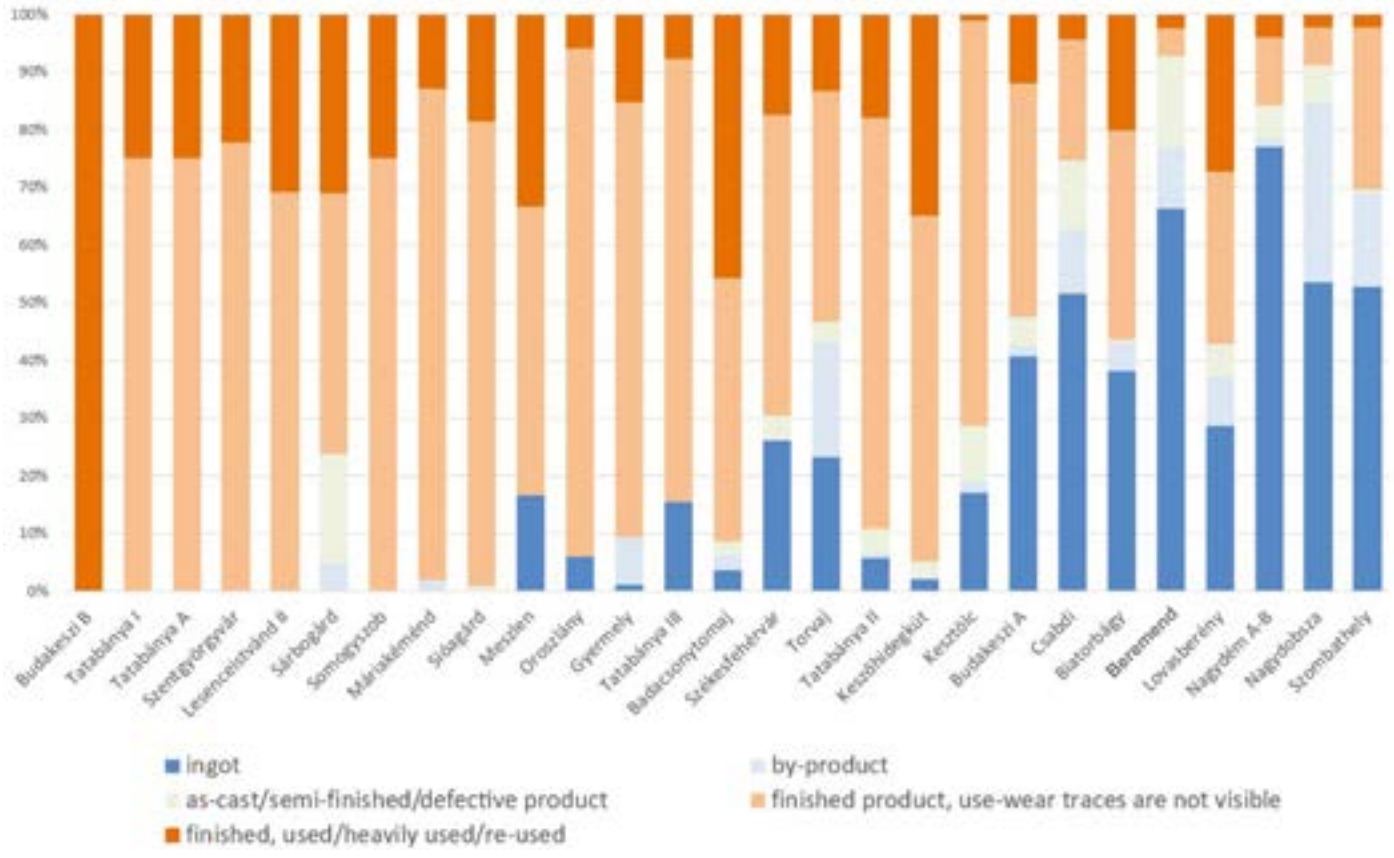


Figure 8.10. Technological groups of Ha A2/Ha B1, Ha A–Ha B1, and Ha B1 hoards from Transdanubia. Diagram made by author.

shaped ingots), a few by-products (jets, droplets, lumps), as-cast/semi-finished and miscast objects, usually axes (e.g., Debrecen type or Palotabozsok type), and quite a few finished products (Fig. 8.10).

Another category is finished and usable products (Group 4). It is worth repeating that objects with no discernible use-wear traces could have been used (see Horn and von Holstein 2017). The fifth group consists of used products, and it can also be sorted into minor subgroups like heavily used objects or reused, modified fragments. Modern wear traces were noted, but they were not included in the chart. The number of used objects is unfortunately not statistically relevant because it depends on how much a studied hoard was suitable for use-wear analysis (e.g., Keszőhidegkút, Tolna Co.; Badacsonytomaj, Veszprém Co.) (Mozsolics 1985a, 87–88, 135–37, pls 31–35; Tarbay 2018, pls 1–6). As with the raw materials set, the finished products can also dominate an assemblage to different degrees. I am aware of pure finished product hoards within the studied material (e.g., Budakeszi B). Some hoards contain one or more of these objects besides the assemblage of raw material. The finished and used products were probably the personal items that had belonged to the depositors. The most obvious is the ornament group that usually comprises rings, a fibulae pair, pins, pendants, phalerae, and knobs. Sometimes only one object represents an entire set. A fine example is the sword from Somogyszob, Somogy Co. It is a small, worn tip fragment, representing the entire weapon and probably the whole 'warrior equipment' (Mozsolics 1985a, 187; Tarbay 2018, 632–34, pl. 283.1). It is noteworthy that in the case of objects of high value or status symbols like weapons and bronze vessels, the depositors strived for 'minimalism'. These finds were deposited in small numbers and usually as *pars pro toto* fragments. The deposition of multiple sets is also observable. Hoards like Lovasberény (Tarbay 2018, pls 169.87–95, 170–80,

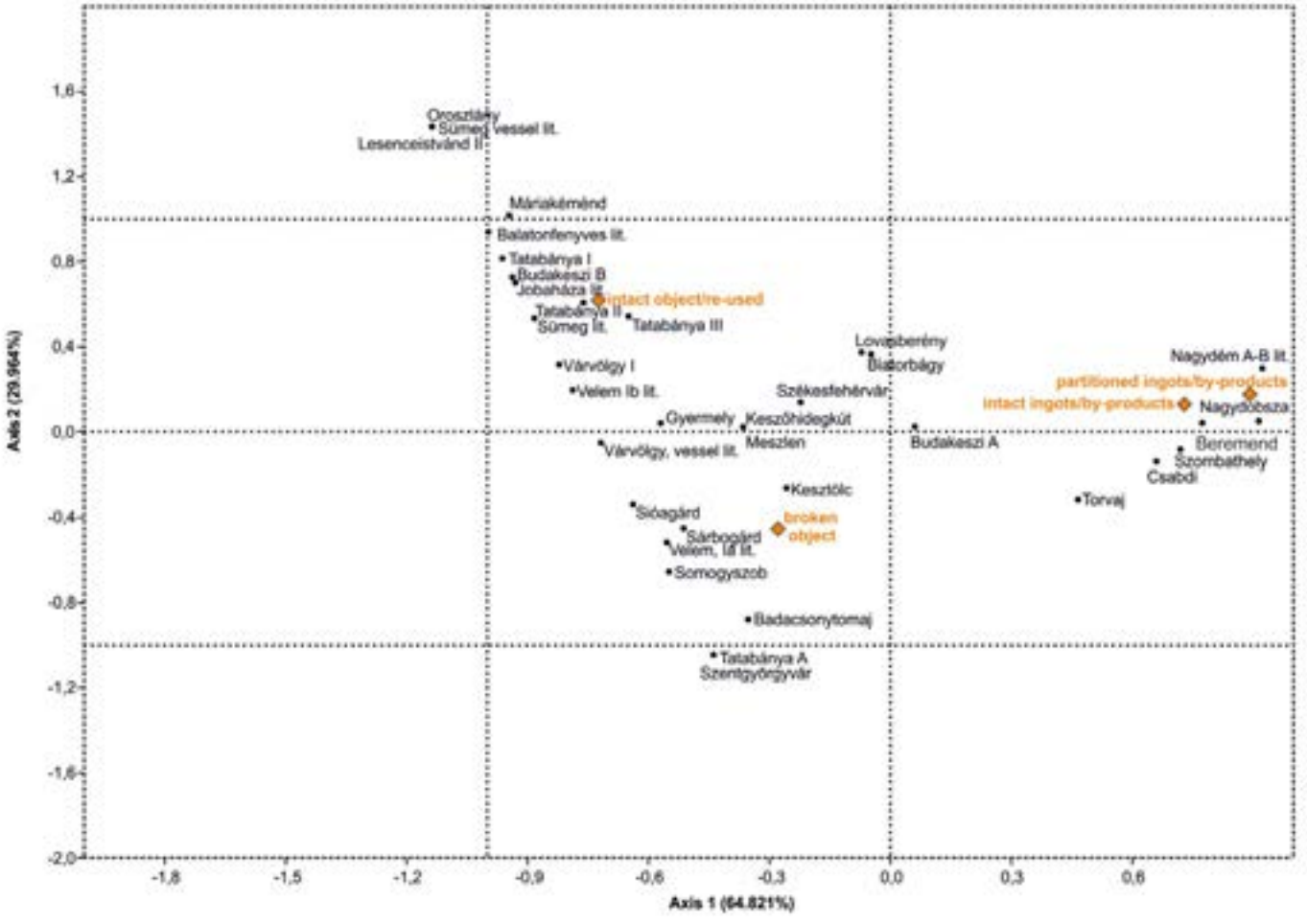


Figure 8.11. Correspondence analysis of the fragmentation of Ha A2/Ha B1, Ha A–Ha B1, and Ha B1 hoards from Transdanubia. Graphic created using Past by author.

181.195–99) contain several rings with tapering terminals. Based on the five rings worn by the deceased woman from Ivanovice na Hané (Parma and others 2018, fig. 4) and the six-piece sets excavated in the Budakeszi hoard, these ornaments from the Lovasberény hoard may have belonged to eighteen or twenty-two people. Regarding technological selection, the Budakeszi A and B hoards are two completely different groups. Hoard B contains solely finished (used) products, while Budakeszi A contains a significant raw material set beside finished and used products. Its technological selection is comparable with the Lovasberény and Biatorbágy hoards (Mozsolics 1985a, 127–28, 144–45; Tarbay 2018, 566–80) (Fig. 8.10).

Fragmentation

The database of the correspondence analysis included thirty-five hoards that I was able to study before the submission of the paper and finds (five hoards) whose fragmentation pattern was reconstructed after data in the literature ('lit'), with the proviso that a personal study of these finds should be used to verify and revise the latter in future analyses. The Velem and Várvölgy-Nagy-Lázhegy II gold hoards (Müller 2013; Ilon 2015) were deliberately left out, as the fragmentation pattern of the numerous spiral tube ornaments is unclear based on published data.

The selected objects were sorted into different categories: intact objects/reused fragments, broken objects, broken-up ingots/by-products, and intact ingots/by-products. The analysis revealed that the studied hoards have no uniform fragmentation pattern because one can differentiate at least four groups. These are the already discussed 'workshop hoards'. The rest are either dominated by broken (e.g., Badacsonytomaj) or intact objects (Budakeszi B) in different ratios. It should be noted that there are also overlaps between these groups. The fourth group are those assemblages

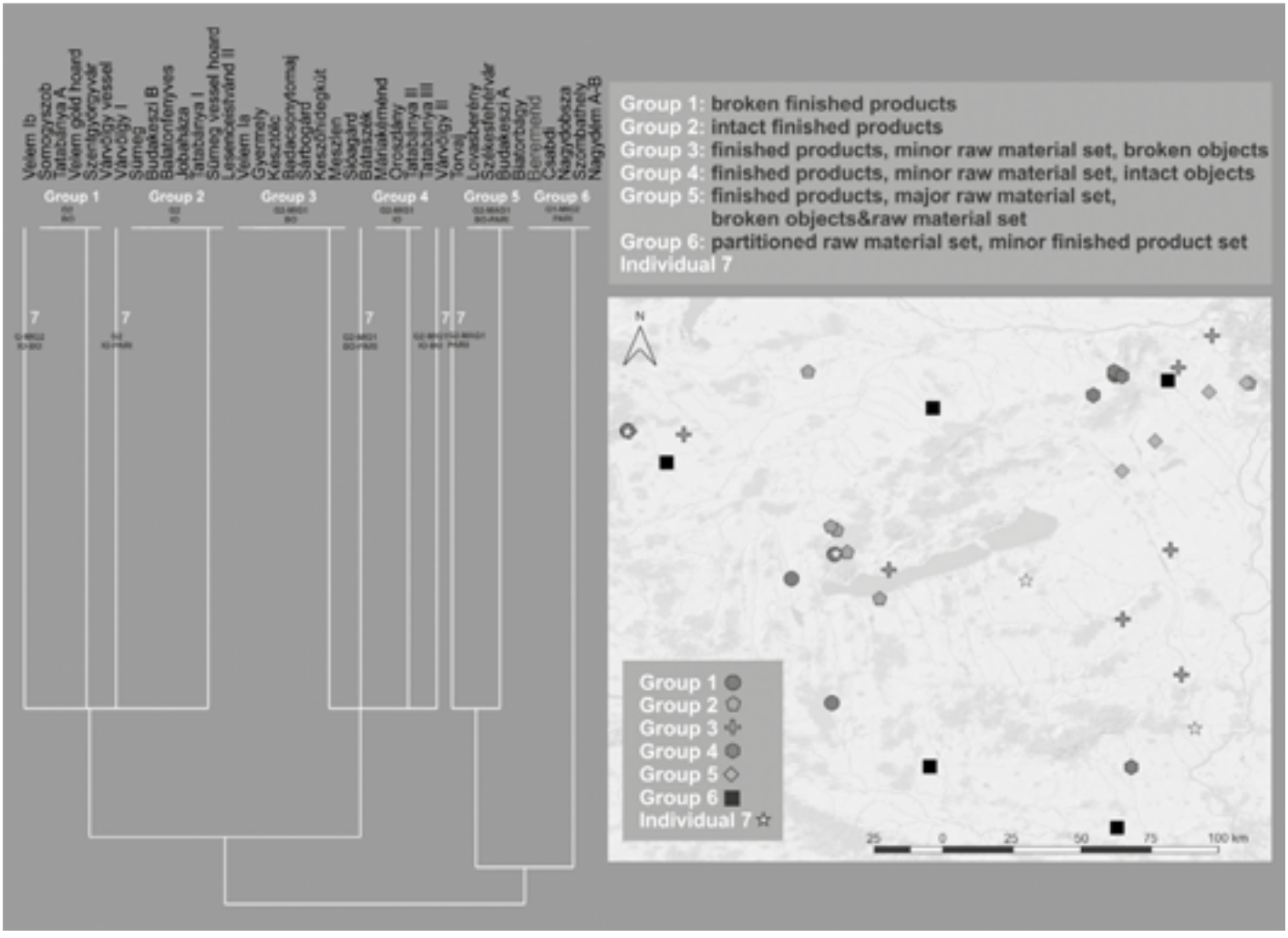


Figure 8.12. Transdanubian selection groups based on fragmentation and technological types. Graphic made utilizing Past and QGIS 3.0.1 by author.

that contain broken-up and intact ingots beside mainly fragmented objects, e.g., Lovasberény, Biatorbágy, Kesztölc, and Budakeszi A (Fig. 8.11).

Transdanubian Hoard Groups and the Budakeszi A–B Finds

The selection of the Transdanubian hoards was discussed above in terms of typology, technology, and fragmentation. I further arranged these assemblages based on the last two aspects by cluster analysis, which suggests the idea that the local hoards deposited in the Ha A2/Ha B1 and Ha B1 do not form a homogenous array from the point of view of selection. They can be interpreted in smaller groups or individually (Velem Ib, Vas Co.; Várvölgy-Nagy-Lázhegy I–II golden hoards, Zala Co.; Bátaszék, Tolna Co.; Torvaj, Somogy Co.) (Hampel 1896, pl. 241; Müller 2013; Mozsolics 1985a, 95, 206; Tarbay 2018, 478–80, 688–90). Regarding their fragmentation pattern and the technological class of the selected objects, the studied hoards can be arranged by cluster analysis into six groups. The principles of grouping in the cluster analysis were the most typical technological set and the ratio of the secondary technological set (minor (1–30 per cent), or major (30–50 per cent)) and the most typical condition of the selected finds (intact/broken finished products, intact/partitioned raw materials). The six main groups are the following: Group 1: assemblages containing primarily broken finished products; Group 2: hoards containing primarily intact finished products; Group 3: hoards primarily containing broken finished products and a minor quantity of raw material; Group 4: hoards primarily containing intact finished products and a minor quantity of raw material; Group 5: hoards containing broken finished products and a major component of broken-up raw material; Group 6: hoards dominated by broken-up (partitioned) raw material. They may also contain a handful of finished products. These six hoard groups can appear scattered in different regions or even within the same site. An excellent example of these distribution patterns is the 6th group or the Velem-Szent Vid hillfort. In some cases, we can observe that geographically relatively close hoards follow a similar most characteristic selection pattern, e.g., 2nd, 3rd, 4th, and 5th (Fig. 8.12).

In practice, the local possibilities of comparing the Budakeszi hoards' selection patterns with the applied methods are exhausted, considering that it is not possible to interpret the obtained patterns in the hoards' internal structuring, which are lost forever due to their undocumented structures. However, it can be concluded that Transdanubia has quite a complex hoarding pattern within a relatively short period. Apart from individual finds such as the elite hoards (e.g., Várvölgy-Nagy-Lázhegy gold hoards, Tatabánya A, Szentgyörgyvár-Felsőmánd B), primarily hoards containing various objects have been discovered, which, according to my findings, can be classified into smaller groups depending on the extent to which they have aligned with the various hoarding concepts. Returning to the question of how the Budakeszi A–B hoard can be characterized within the Transdanubian hoarding pattern, the following conclusions can be drawn: even though the two hoards were probably deposited around the same time, beside each other, they have a completely different character.

Hoard A is connected to nearby Group 5 finds such as Lovasberény, Székesfehérvár (Fejér Co.), and Biatorbágy (Pest Co.) (Petres 1960; Mozsolics 1985a, 127–28, 144–45) (Fig. 8.12). These assemblages typically contain several finds that are either finished products or raw material assemblages. They are mainly characterized by the selection of broken finished products and broken-up raw materials. It is important to note that the placing of objects in the Budakeszi A hoard is analogous to that reconstructed in the case of Kesztölc (Figs 8.5–8.6). Therefore, this hoard is also closely related, despite it being placed into a different group (Group 3) than the rest. In the case of the Budakeszi A hoard and its related finds, one can observe close ties. The depositors had access to a typologically and technologically similar assemblage of material. When these people assembled these hoards, they may have had the same motive for hoarding; thus, they may have followed the same symbolic thoughts and ritual traditions that were required to achieve the desired effect of the hoarding act. Because of their geographical proximity, it cannot be ruled out that the hoarding act was committed by the same or a closely related community. On the other hand, hoard B is much more unique. It consists of primarily finished and used objects organized in a set-like manner. A closely related parallel from this region is not really known. This hoard can be mostly related to the Group 2 assemblages, which contain a small number of objects with a similar technological and fragmentation profile. The distribution of these hoards is mainly concentrated in the west Balaton region, although some of them have been found further away (e.g., Jobaháza, Győr-Moson-Sopron Co.) (Mozsolics 2000, 50, pl. 41.1–19). The geographically closest assemblage to Budakeszi is the Tatabánya I (Komárom-Esztergom Co.) hoard (Tarbay 2020a, fig. 10).

Conclusions

I share the idea that all hoards are the result of an individual act, and their deposition is driven by unique motivations. The exact composition of the hoards was

most likely determined along with unique, sometimes even very personal, symbolic thoughts. This is the reason why hoards with the exact same composition are nowhere to be found. However, recurring patterns are observable among the Late Bronze Age material. This has been known since the first works dealing with the typo-chronological grouping and statistical analysis of hoards based on typological data derived from publications. Behind the selection of Late Bronze Age hoards, one can observe some main concepts or what we might call traditions that were followed by the depositors to varying degrees. Recurring patterns can be identified in the typological composition of a hoard, the degree of fragmentation of the deposited objects, and their technological character. In the study, I relied on approaches and analytical methods that helped to characterize complex hoards containing various objects more accurately and from a different perspective.

The study has discussed new bronze hoards from Budakeszi-Őzvölgy-tető (Pest Co.), and assemblages from Transdanubia, west Hungary, which were found previously. During the Ha B1 period of the Late Bronze Age, hoards with different characteristics emerged in this region. The motives for their deposition were surely different, as were their depositors, who may have belonged to different groups of contemporary Urnfield society. Some assemblages reflect the power of the local elite, who gave up rare gold ornaments and deliberately destroyed bronze feasting sets, rare weapons, and even wagon parts through votive depositional acts. Other hoards consisted of only a few objects, the possessions of one man or woman who selected them for unique and personal motivations. In this region, the most characteristic hoards contained several different objects. These are the ones that I have aimed to model better. The results of this work relied on metalwork wear analysis and the statistical analysis of typological, technological, and fragmentation data. It seems that this seemingly homogenous group can, in fact, be divided into several closely related subgroups that, in certain cases, show regional patterns (Fig. 8.12). Each group can be well characterized by the degree and type of fragmented objects they contain, as well as their technological types. These hoards are very closely related, they are not only similar from a 'typological point of view'. Therefore, it is likely that deposition was carried out by people or communities who shared similar symbolic thoughts and followed common ritual traditions, perhaps even motivations. The people behind these hoards can be best identified through the assemblages or sets of objects in the deposits that can be reconstructed by identifying functionally and technologically related object groups. The most obvious ones are the raw material sets of different sizes and the individual sets made of different types of finished products like ornaments, tools, or weapons.

The Budakeszi A and B hoards are particularly important in any discussion on how to define these sets. These are the only two assemblages that could give us a hint about how the sets in the formerly found hoards with similar content could have been manipulated during deposition. The Budakeszi assemblages are also fine examples of the point raised by Tudor Soroceanu (1995) that the place of the deposited objects shows regularities and therefore plays an important role in interpretation. Hoard A and hoard B are highly structured assemblages because they are vertically and horizontally organized, and technologically related objects are arranged into groups by the depositors themselves. In the study, I have also presented some similar Hungarian hoards from Kesztölc (Komárom-Esztergom Co.), Nagydém (Veszprém Co.), Pázmándfalu (Győr-Moson-Sopron Co.), and Hódmezővásárhely (Csongrád-Csanád Co.). The content and characteristics of these assemblages also support the idea that such fine similarities in placement and the set-like grouping of the objects in hoards were practised in this region.

The interpretation of the Budakeszi hoards is a work in progress that requires further fieldwork, landscape, and natural scientific analysis. In a recently published book, we proposed a hypothesis that can provide an interpretation of the Budakeszi find based on the current data (see Tarbay 2022). Solely relying on the in-depth analysis of the content, the following thoughts can be formulated: the hoards were deposited roughly around the same time or all at once (Ha B1) by several people. The selection of these hoards, particularly in the case of hoard A, followed local traditions regarding the type, condition, and technological character of the deposited objects. The analysis of the contemporary regional hoarding patterns suggests that this assemblage was closely related to the Biatorbágy (Pest Co.), Lovasberény (Fejér Co.), Kesztölc (Komárom-Esztergom Co.), and Székesfehérvár (Fejér Co.) hoards that may have been deposited by a community who followed a similar ritual and symbolic tradition during hoarding. The two hoards can be differentiated into sets, and their overall selection pattern reflects a 'wasteful' deposition process. In the framework of the hoarding act, a significant amount of mostly partitioned (used) raw material was taken from an active metallurgical workshop and placed as the core heap of hoard A. Also, multiple ornament sets related to different people were placed, which were clearly separated in space. Personal objects, a common knob sickle, a used spearhead, and a rare and prestigious bronze vessel were intentionally broken into pieces, and their fragments were placed in different parts of the hoard. Hoard B is an independent entity in all aspects. It consists of relatively intact objects that had been used for a long period of time. These personal finds are a set of spearheads, axes, and a fibulae pair. All are

objects with potentially complex biographies. Such a set could be part of the property of one or two people who owned them throughout their lives. The highly structured nature of these finds and their relationship to other assemblages found in this region suggests the idea that they were votive hoards following local ritual traditions.

Acknowledgements

I am grateful for the János Bolyai Research Fellowship of the Hungarian Academy of Sciences.

Works Cited

Archaeológiai Értesítő. 1892. 'Nagy-Démi bronzlelet', *Archaeológiai Értesítő*, 12: 383–84

Armbruster, Barbara Regine. 2000. *Goldschmiedekunst und Bronzetechnik: Studien zum Metallhandwerk der Atlantischen Bronzezeit auf der Iberischen Halbinsel*, Monographies instrumentum, 15 (Montagnac: Mergoil)

Bader, Tiberiu. 2015. 'Zur Chronologie der Lanzenspitzen im Karpaten-Donau Raum', in *Bronze Age Chronology in the Carpathian Basin: Proceedings of the International Colloquium from Târgu Mureș, 2–4 October 2014*, ed. by Rita E. Németh and Botond Rezi, Bibliotheca Mvsei Marisiensis, seria archaeologica, 8 (Târgu Mureș: Mega), pp. 373–91

Banner, János. 1942. 'Bronz kincslelet és egyéb megfigyelések a hódmezővásárhelyi Fehértó partján', *Dolgozatok a Magyar Királyi Horthy Miklós Tudományegyetem Régiségtudományi Intézetéből*, 18: 147–50

——. 1945. 'Bronzleletek Hódmezővásárhely határában', *Archaeológiai Értesítő*, 3.5–6: 29–42

Czajlik, Zoltán. 2012. *A Kárpát-medence fémnyersanyag-forgalma a későbronzkorban és a vaskorban* (Budapest: Komáromi Nyomda és Kiadó Kft.)

Dzięgielewski, Karol, Anna Longa, Jezry Langer, and Magdalena Moskal-del Hoyo. 2019. 'Contextualisation of the Early Iron Age Hoard of Bronze Objects Discovered in Gdynia Karwiny, Site 1', *Recherches archéologiques*, 10: 21–78

Dolfini, Andrea, and Rachel J. Crellin. 2016. 'Metalwork Wear Analysis: The Loss of Innocence', *Journal of Archaeological Science*, 66: 78–87

Fontijn, David R. 2002. 'Sacrificial Landscapes: Cultural Biographies of Persons, Objects and "Natural" Places in the Bronze Age of the Southern Netherlands, *c.* 2300–600 BC', *Analecta praehistorica leidensia*, 33–34: 1–392

Hagl, Monika. 2008. *Ein urnenfelderzeitlicher Depotfund von Bullenheimer Berg in Franken (Hort F)*, Bayerische Vorgeschichtsblätter, 19 (Munich: Beck)

Hampel, József. 1893. 'Nagy-Démi Bronzlelet', *Archaeológiai Értesítő*, 13: 131–33

——. 1896. *A Bronzkor emlékei Magyarhonban*, III: *Rész: Áttekintő ismertetés* (Budapest: Orsz. Rég. és Embertani Társulat)

Hansen, Svend. 1994. *Studien zu den Metalldeponierungen während der älteren Urnenfelderzeit zwischen Rhônetal und Karpatenbecken*, Universitätsforschungen zur prähistorischen Archäologie, 21, 2 vols (Bonn: Habelt)

——. 1996. 'Bemerkungen zur Zeitlichen Stellung der Hortfunde des Typus Gyermely', *Archäologisches Korrespondenzblatt*, 26: 433–41

Hermann, Raphael, Rachel J. Crellin, Marion Uckelmann, Quanyu Wang, and Andrea Dolfini. 2020. *Bronze Age Combat: An Experimental Approach*, British Archaeological Reports, International Series, 2967 (Oxford: BAR)

Hill, Brian, and Andrew Putland. 2014. *Silversmithing: A Contemporary Guide to Making* (Ramsbury: Crowood)

Horn, Christian, and Isabella C. C. von Holstein. 2017. 'Dents in our Confidence: The Interaction of Damage and Material Properties in Interpreting Use-Wear on Copper-alloy Weaponry', *Journal of Archaeological Sciences*, 81: 90–100

Huth, Christian. 2008. 'Horte als Geschichtsquelle', in *Vorträge des 26. Niederbayerischen Archäologentages*, ed. by Karl Schmotz (Rahden: Leidorf), pp. 131–62

Ilon, Gábor. 2004. *Szombathely őskori településtörténetének vázlata. Avagy a római kor előtt is volt élet*, Őskorunk, 2 (Szombathely: Vas Megyei Múzeumok Igazgatósága)

——. 2015. *The Golden Treasure from Szent Vid in Velem: The Costume of a High-Ranking Lady of the Late Bronze Age in the Light of New Studies*, Series minor, 36 (Budapest: Archaeolingua)

Jamaković, Orhan. 2011. 'Kraj bronzanog i početak željeznog doba na prostoru sjeverozapadne Bosne', *Godišnjak Jahrbuch*, 40: 91–131

Jankovits, Katalin. 2017. *Die bronzezeitlichen Anhänger in Ungarn*, Studia ad archaeologiam Pazmaniensia, 9 (Budapest: Archaeolingua)

Joy, Jody. 2009. 'Reinvigorating Object Biography: Reproducing the Drama of Object Lives', *World Archaeology*, 41.4: 540–56

Jungbert, Béla. 1986. 'Spätbronzezeitlicher Depotfund von Tatabánya-Ótelep', *Communicationes archaeologicae Hungariae*, 1986: 17–25

Kemenczei, Tibor. 1983. 'A Tatabánya-Bánhidai Bronzlelet', *Archaeológiai Értesítő*, 110: 61–68

——. 1996. 'Angaben zur Frage der endbronzezeitlichen Hortfundstufen im Donau-Theißgebiet', *Communicationes archaeologicae Hungariae*, 1996: 53–92

Knight, Matthew G. 2019. 'Going to Pieces: Investigating the Deliberate Destruction of Late Bronze Age Swords and Spearheads', *Proceedings of the Prehistoric Society*, 85: 251–72

Kőszegi, Frigyes. 1988. *A Dunántúl története a későbronzkorban*, BTM Műhely, 1 (Budapest: Budapesti Történeti Múzeum)

Kristiansen, Kristian. 2002. 'The Tale of the Sword – Swords and Swordfighters in Bronze Age Europe', *Oxford Journal of Archaeology*, 21.4: 319–32

Kuśnierz, Jerzy. 1998. *Die Beile in Polen*, III: *(Tüllenbeile)*, Prähistorische Bronzefunde, 9.21 (Stuttgart: Steiner)

Lauermann, Ernst, and Elisabeth E. Rammer. 2013. *Die urnenfelderzeitlichen Metallhortfunde Niederösterreichs: Mit besonderer Berücksichtigung der zwei Depotfunde aus Enzersdorf im Thale*, Universitätsforschungen zur prähistorischen Archäologie, 226 (Bonn: Habelt)

Martin, Jens. 2009. *Die Bronzegefäße in Mecklenburg-Vorpommern, Brandenburg, Berlin, Sachsen-Anhalt, Thüringen und Sachsen*, Prähistorische Bronzefunde, 2.16 (Stuttgart: Steiner)

Mészáros, Gyula. 1972. 'A Nagyvejkei későbronzkori kincslelet', *A Szekszárdi Béri Balogh Ádám Múzeum Évkönyve*, 2–3: 19–47

Modl, Daniel. 2010. 'Zur Herstellung und Zerkleinerung von planokonvexen Gusskuchen in der spätbronzezeitlichen Steiermark', *Experimentelle Archäologie in Europa*, 2010: 127–51

Mozsolics, Amália. 1950. *Der Goldfund von Velem-Szentvid: Ein Beitrag zur Metallkunst der älteren Hallstattzeit*, Praehistorica, 1 (Basel: Prometheus)

——. 1983. 'Ein Beitrag zum Metallhandwerk der ungarischen Bronzezeit', *Bericht des Römisch-Germanischen Komission*, 65: 19–72

——. 1985a. *Depotfundhorizonte von Aranyos, Kurd und Gyermely* (Budapest: Akadémiai Kiadó)

——. 1985b. 'Ein Beitrag zum Metallhandwerk der ungarischen Bronzezeit', *Bericht der Römisch-Germanischen Kommission*, 65, 20–72

——. 2000. *Bronzefunde aus Ungarn: Depotfundhorizonte Hajdúböszörmény, Romånd und Bükkszentlászló*, Prähistorische Archäologie in Südosteuropa, 17 (Kiel: Oetker Voges)

Müller, Róbert. 2006. 'Várvölgy-Nagy-Lázhegy késő bronzkori földvár kutatása', in *'Gondolják, látják az várnak nagy voltát…': Tanulmányok a 80 éves Nováki Gyula tiszteletére*, ed. by Gyöngyi Kovács and Zsuzsa Miklós (Budapest: Castrum Bene Egyesület, Históriaantik Könyvesház Kiadó), pp. 227–35

——. 2013. 'A második késő bronzkori aranykincs Várvölgyről', *Archaeológiai Értesítő*, 138: 81–103

——. 2017. 'Die spätbronzezeitliche Höhensiedlung von Várvölgy, Nagy-Lázhegy (Komitat Zala)', in *State of the Hungarian Bronze Age Research: Proceedings of the Conference Held between 17th and 18th of December 2014*, ed. by Gabriella Kulcsár, Gábor V. Szabó, Viktória Kiss, and Gábor Váczi, Prehistoric Studies, 2 (Budapest: Robinco Kft.), pp. 41–49

Nessel, Bianka. 2014. 'Bronze Age Portioning of Raw Metal Concepts, Patterns and Meaning of Casting Cakes', *Apulum: Acta Musei Apulensis*, 51: 401–25

Parma, David, Peter Barta, Ivana Jarošová, Sylvia Kaupová, Miriam Nývltová Fišáková, and Lenka Vargová. 2018. 'A Cruel Fate? The Unique Bronze Age Burial from Ivanovice na Hané (okr. Vyškov/CZ)', *Archäologisches Korrespondenzblatt*, 48.3: 323–37

Pászthory, Katharine, and Eugen Friedrich Mayer. 1998. *Die Äxte und Beile in Bayern*, Prähistorische Bronzefunde, 9.20 (Stuttgart: Steiner)

Patay, Pál. 1990. *Die Bronzegefäße in Ungarn*, Prähistorische Bronzefunde, 2.10 (Munich: Beck)

Patek, Erzsébet. 1968. *Die Urnenfelderkultur in Transdanubien*, Archaeologia hungarica, 44 (Budapest: Akadémiai Kiadó)

Pearce, Mark. 2013. 'The Spirit of the Sword and Spear', *Cambridge Archaeological Journal*, 23.1: 55–67

Petres, Éva. 1960. 'A székesfehérvári kora vaskori kincslelet', *Folia archaeologica*, 12: 35–43

Pietzsch, Artur. 1968. 'Rekonstruktion getriebener Bronzegefässe', *Arbeits- und Forschungsberichte zur sächsischen Bodendenkmalpflege*, 18: 237–83

Říhovský, Jiří. 1992. *Die Äxte, Beile, Meißel und Hämmer in Mähren*, Prähistorische Bronzefunde, 9.17 (Stuttgart: Steiner)

Roberts, Ben, and Barbara S. Ottaway. 2003. 'The Use and Significance of Socketed Axes during the Late Bronze Age', *European Journal of Archaeology*, 6.2: 119–40

Soroceanu, Tudor. 1995. 'Die Fundumstände bronzezeitlicher Deponierungen – Ein Beitrag zur Hortdeutung beiderseits der Karpaten', in *Bronzefunde aus Rumänien*, ed. by Tudor Soroceanu, Prähistorische Archäologie in Südosteuropa, 10 (Berlin: Spiess), pp. 15–80

——. 2008. *Bronzefunde aus Rumänien*, III: *Die vorskythenzeitlichen Metallgefäße im Gebiet des heutigen Rumänien* (Cluj-Napoca: Accent)

—— 2011. 'Zweigeteilte Einheit oder geeinte Zweiheit? Zur Frage der Dualität in den bronzezeitlichen Deponierungen', in *Bronze Age Rites and Rituals in the Carpathian Basin. Proceedings of the International Colloquium from Târgu Mureş 8-10 October 2010*, ed. by Sándor Berecki, Rita E. Németh, and Botond Rezi, Bibliotheca Mvsei Marisiensis, seria archaeologica, 4 (Târgu Mureş: Mega), pp. 269–94

Szabó, Géza. 1993. 'Fémmegmunkálási nyomok a Regöly-Veravár késő bronzkori leletegyüttes tárgyain', *Wosinsky Mór Múzeum Évkönyve*, 18: 169–224

——. 2013. *A dunántúli urnamezős kultúra fémművessége az archaeometallurgiai vizsgálatok tükrében*, Specimina electronica antiquitatis, 1 (Pécs: PTE-BTK-TTI, Ókortörténeti Tanszék)

Száraz, Csilla. 2017. 'Late Bronze Age Sites in Zala County (Southwestern Hungary)', in *State of the Hungarian Bronze Age Research: Proceedings of the Conference Held between 17th and 18th of December 2014*, ed. by Gabriella Kulcsár, Gábor V. Szabó, Viktória Kiss, and Gábor Váczi, Prehistoric Studies, 2 (Budapest: Robinco Kft.), pp. 51–83

Szathmári, Ildikó. 2005. 'Folyókból előkerült bronzkori kardleletek a Magyar Nemzeti Museum gyűjteményében', *Communicationes archaeologicae Hungariae*, 2005: 143–66

Tarbay, János Gábor. 2014. 'Late Bronze Age Depot from the Foothills of the Pilis Mountains', *Dissertationes archaeologicae ex Instituto archaeologico Universitatis de Rolando Eötvös nominatae*, 3.2: 179–297

——. 2015. 'A New Late Bronze Age Warrior Equipment from East Central Europe', *Archaeologiai Értesítő*, 140: 29–70

——. 2016. 'The Late Bronze Age "Scrap Hoard" from Nagydobsza. Part I', *Communicationes archaeologicae Hungariae*, 2016: 87–146

——. 2017. 'Égitestek, bronzkincsek, rituálék … Késő bronzkori fémleletek Hajdúböszörmény határából: Zelemér és Hetven-Laponyag', in *A második hajdúböszörményi szitula és kapcsolatrendszere*, ed. by Gábor V. Szabó, Marianna Bálint, Gábor Váczi, and Gábor Lőrinczy, Studia oppidorum Haidonicalium, 13 (Budapest: Robinco Kft.), pp. 105–46

——. 2018. 'A gyermelyi típusú kincsek és koruk' (unpublished doctoral thesis, Eötvös Loránd University, Institute of Archaeological Sciences, Budapest)

——. 2020a. 'Melted Swords and Broken Metal Vessels. A Late Bronze Age Assemblage from Tatabánya-Bánhida and the Selection of Melted Bronzes', *Dissertationes archaeologicae ex Instituto archaeologico Universitatis de Rolando Eötvös nominatae*, 3.7: 29–99

——. 2020b. 'Type Gyermely Hoards and their Dating. A Supplemented Thesis Abstract', *Dissertationes archaeologicae ex Instituto archaeologico Universitatis de Rolando Eötvös nominatae*, 3.7: 331–43

——. Forthcoming. 'Biographical Possibilities of Spear Deposition in Transdanubia and the Late Bronze Age Spearheads from Budakeszi-Őzvölgy tető A and B Hoards', in *Prehistoric Communities along the Danube*, ed. by Tomislav Hršak and Marko Dizdar, Osijek/Zagreb (manuscript accepted, 6 February 2021)

——. 2022. *Twin Hoards: Metals and Deposition in the Late Bronze Age Buda Hills, the Pilis and the Visegrád Mountains during the Late Bronze Age* (Budapest: Hungarian National Museum)

Tarbay, János Gábor, and Bálint Havasi. 2019. 'Wheels, Vessels and Late Bronze Age Fibulae – An "Elite Hoard" from Szentgyörgyvár-Felsőmánd, Site B (Hungary, Zala County)', in *'TRANS LACUM PELSONEM': Prähistorische Forschungen in Südwestungarn (5500–500 v. Chr.)*, ed. by Eszter Bánffy and Judit P. Barna, Castellum Pannonicum Pelsonense, 7 (Budapest: Leidorf), pp. 385–415

Tarbay, János Gábor, and Boglárka Maróti. 2023. 'Preliminary Handheld XRF Analysis of Late Bronze Age Metal Finds from the Budakeszi-Őzvölgy-tető Site (Pest County, Hungary) – A Budakeszi-Őzvölgy-tetőről (Pest megye) származó késő bronzkori fémleletek előzetes kézi XRF elemzése', *Archeometriai Műhely*, 20.1: 23–36

Țerna, Stanislav V., and Denis A. Topal. 2013. 'Два новых клада и единичные находки металлических изделий эпохи бронзы – раннего гальштатта с территории Республики Молдова' ['Two New Hoards and Single Finds of Bronze Age–Early Hallstatt Metal Artefacts from the Territory of the Republic of Moldova'], *Tyragetia*, 7.22.1: 189–204

Tompa, Ferenc. 1928. 'A felsőzsidi lele't, *Archaeologiai Értesítő*, 42: 204–07, 344–45

V. Szabó, Gábor. 2019a. *Bronzkori kincsek Magyarországon: Földbe rejtett fegyverek, eszközök, ékszerek nyomában*, Hereditas archaeologica Hungariae, 3 (Budapest: Archaeolingua)

——. 2019b. 'Die goldene Beinschiene, das Panzerdepot und das Schwertpaar. Neue Narrative zur Ideologie der spätbronzezeitlichen Kriegerelite in Ungarn', in *Materialisation of Conflicts: Proceedings of the Third International LOEWE Conference, 24–27 September 2018 in Fulda*, ed. by Svend Hansen and Rüdiger Krause, Universitätsforschungen zur prähistorischen Archäologie, 346 (Bonn: Habelt), pp. 163–89

Váczi, G. 2013. 'A Kelet-Dunántúl kapcsolatrendszerei és kulturális interakciói az urnamezős időszakban' (unpublished doctoral dissertation, Eötvös Loránd University Institute of Archaeological Sciences)

Vích, David. 2012. 'Kladky – neznámé hradiště na severozápadní Moravě. Možnosti detektorového průzkumu v archeologii', *Památky Archeologické*, 103: 233–72

Vinski-Gasparini, Ksenija 1973. *Kultura polja sa žarama u sjevernoj Hrvatskoj* (Zadar: Filozovski Fakultet Zadar)

Vorlauf, Dirk. 1990. 'Technische Bemerkungen zur Herstellung der Bronzenen Ringgehänge aus dem Hortfund von Allendorf', *Experimentelle Archäologie in Deutschland*, 4: 369–70

Zoltai, Lajos. 1909. 'Réz-és bronzkori leletek Debreczen város múzeumában', *Múzeumi és Könyvtári Értesítő*, 3.1: 24–28

9. Late Bronze Age Hoard from Nowe Kramsko

Is There a Method in Fragments?

▾ **ABSTRACT** Due to the presence of casting tools, the hoard from Nowe Kramsko is usually referred to in the literature as a 'metalworker's hoard'. But the inventory of the hoard mainly consists of pieces of artefacts such as knobbed sickles and axes. The research aimed to analyse metalwork from the hoard and combine the analyses of manufacture and use-wear traces with the analyses related to the weights of metal artefacts deposited in the hoard.

A set of methods was used to achieve the goal. Using macro- and microscopic observations, we could investigate the surfaces of metal objects. The second goal was achieved by using Cosine Quantogram Analysis (CQA) and Frequency Distribution Analysis (FDA).

The analyses allowed us to observe which artefacts were used before deposition and which were deposited in their raw form. The results showed that most artefacts in the hoard bear no traces of use. In the case of metals with use-wear traces, no clear differences in the usage pattern were noticed between the complete objects and the fragments. The main groups of artefacts — the sickles and the axes — show traces of preparation for use as well as use wear. These observations show that some deposited artefacts were used before fragmentation and deposition. Additionally, two types of fragmentation related to specific categories of metals have been identified. The axes and spearheads were struck and crushed. In the case of sickles and bracelets, most of the deliberate and planned fragmentation is indicated by the technique using a pre-incision.

The weighing system analysis provided satisfactory results, considering the small sample of the tested artefacts. What is extremely important, is that even in the case of a relatively small collection it was possible to prove that the hoard fits into the European weight system.

▾ **KEYWORDS** Bronze Age, metal hoard, fragmentation, weight systems, use-wear analyses

Kamil Nowak • Institute of Archaeology, Nicolaus Copernicus University in Toruń (kamil.nowak@umk.pl)
Nicola Ialongo • Department of Archaeology and Heritage Studies, Aarhus University (nicola.ialongo@cas.au.dk)

Hoards from the European Bronze and Iron Ages: Current Research and New Perspectives, ed. by Marcin Maciejewski, János Gábor Tarbay, and Kamil Nowak, NAA, 4 (Turnhout, 2024), pp. 131–148.
BREPOLS PUBLISHERS DOI 10.1484/M.NAA-EB.5.142441

Introduction

Regarding the number of artefacts (n=512), the hoard from Nowe Kramsko is one of the biggest in Poland. What makes the hoard unique is the co-occurrence of metallurgy-related tools, fully preserved metalwork, and an exceptionally large number of broken sickles, axes, and ornaments. Due to the metallurgical toolkit and metal fragments, so-called scrap metal, the hoard from Nowe Kramsko was originally interpreted as belonging to a craftsman or metalworker (Michalak and Orlicka-Jasnoch 2019).

The problem of fragmentation of metal objects has been given a lot of attention in scientific articles, and recently, this topic has become extremely popular (e.g., Lago and others 2023). Mainly, the issues of the sacral or utilitarian role of fragments in hoards, the purposefulness or randomness of their creation, as well as possible weight relationships are discussed. Our aim is not to address the general meaning of fragmentation in European hoards, for which we refer the reader to broader syntheses (e.g., Rezi 2011; Dietrich 2014; Brandherm 2018; Fontijn 2020). In this article, we will attempt to answer a specific question that was posed recently by Knight (2021): Is there really a method in all these fragments? We will use Nowe Kramsko to test the likelihood that bronze objects were intentionally fragmented to obtain predetermined mass values. This study presents a methodological framework to test small samples of fragments in individual contexts, based on a larger study involving broad regions of Europe (Ialongo and Lago 2021).

The Hoard of Nowe Kramsko

Discovery, Context, and Location

The hoard was discovered in November 2015. According to the person who delivered the artefacts to the Archaeological Museum of the Central Odra River Area in Świdnica, metal objects were lying on the surface of an arable field. The finder reported that there was a 'longitudinal band' of metal objects on the field surface that began where the bottom of a ceramic vessel lay. Everything indicates that the vessel containing the items was ploughed out during agricultural work in the autumn. It is not known how long the items remained on the field, but it most likely was not for long, based on the duration of the agricultural season in Poland. The

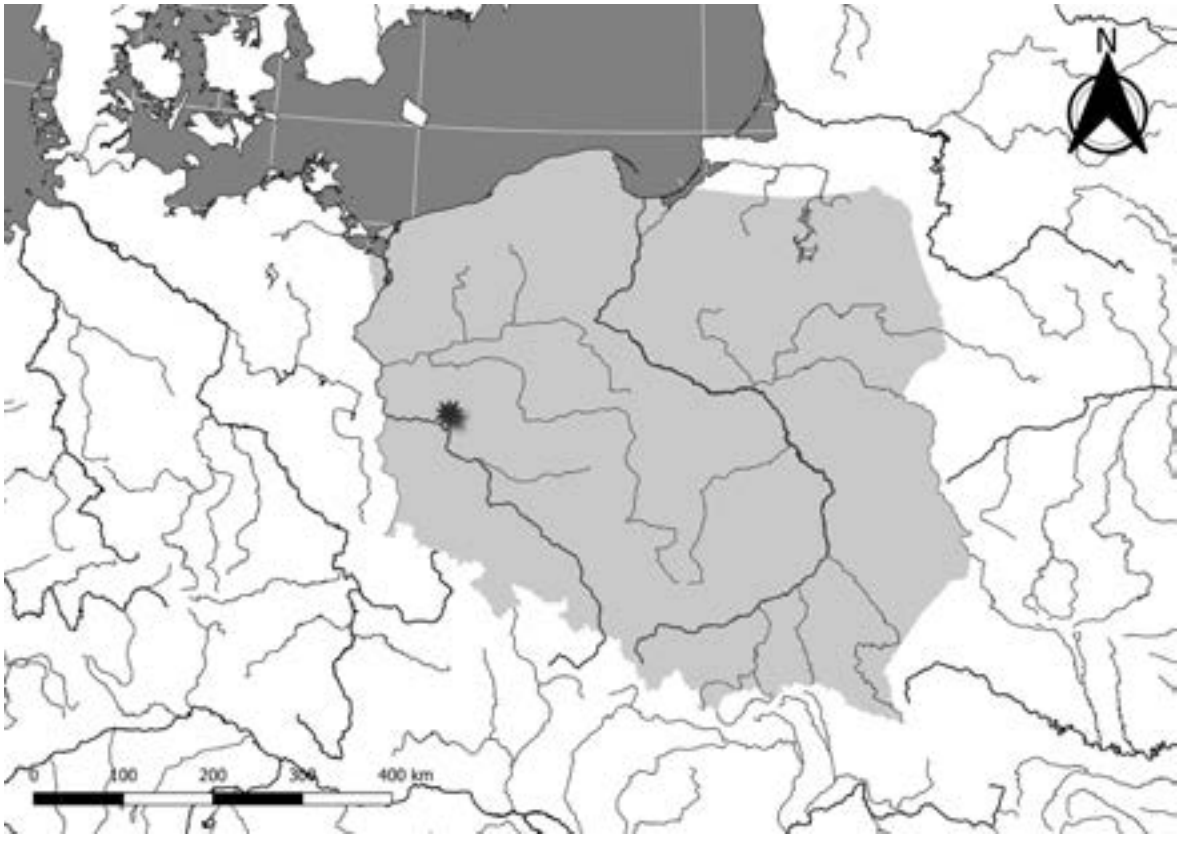


Figure 9.1. Location of the hoard on the map of Poland. Prepared by K. Nowak.

find was published as a monograph in Polish (Michalak and Orlicka-Jasnoch 2019 with a detailed descriptive and illustrative catalogue of finds on pp. 60–135), which does not include a broader analysis of the fragments.

The place where the hoard was discovered is located south of the small village of Nowe Kramsko in western Poland (Fig. 9.1). The site is located approximately 350 m from the northern end of the Wojnowskie Zachodnie lake. The hoard was deposited on a sand dune, on the eastern side of a small watercourse flowing from the north to the lake. Until the hoard's discovery, no archaeological site was known at this location. During field research carried out immediately after the discovery, additional fragments of Late Bronze Age pottery were found, indicating a prehistoric settlement in this place.

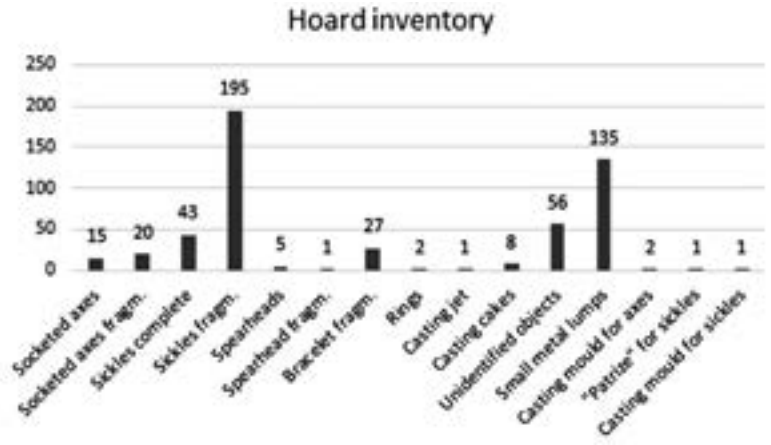


Figure 9.2. The inventory of the hoard from Nowe Kramsko. Prepared by K. Nowak.

The Hoard's Inventory, Main Characteristics

The hoard consists of 512 metal objects with a total weight of approximately 14 kg. The deposit includes socketed axes, knobbed sickles, spearheads, two small rings, and a large number of fragments of sickles, axes, and ornaments. Additionally, the hoard contained artefacts related to metallurgy: a two-part casting mould for socketed axes, a solid metal model, and a probable mould (a 'lid') for casting a sickle (Fig. 9.2). The typological analysis shows that the hoard consisted mainly of artefacts of local provenance, while imports were few.

The socketed axes (n=15) are not a homogeneous set. Ten axes should be considered local products, belonging to the so-called Lusatian type of socketed axes. Five axes represent forms of Middle Danube origin. The axe fragments (n=32) come from both the 'Lusatian' and the 'Middle Danube' types.

The spearheads (n=5) are rather small and stocky, without characteristic features. They can be classified into two types: spearheads with laurel and diamond-shaped leaves. The hoard inventory also includes a fragment of a much larger spearhead of an undefined type.

Sickles and their fragments are the most numerous: forty-three artefacts are complete, while 195 are fragmented. Among the fragmented sickles, eleven have only small parts missing (mostly the tip of the blade), and twenty-two comprise about two-thirds of the entire item. The most numerous set (n=162) includes fragments from different parts of sickles: parts with a base and a knob (n=50), middle parts (n=74), and small blade tips (n=38). With one exception, all typologically identified sickles are the so-called Lusatian knobbed sickles. One fragmentary sickle has a tang. No fragments were matched during macroscopic observation.

Bracelets appeared in the hoards' inventory only in fragments (n=27). The fragments come from at least four types of bracelets: made of flat-convex bronze strips and semi-oval, triangular, and circular bars. Additionally, the inventory includes two metal rings, a fragment of a casting jet separated from the sickle, 135 shapeless metal lumps, forty-five small metal fragments with an undetermined function, and eight small casting cakes.

The hoard inventory from Nowe Kramsko consists mainly of products that are not very characteristic, with a wide time frame of use. The hoard generally contains bronzes assigned to two consecutive chronological sequences, dated to Ha B1–Ha B2/Ha B3. To the older group probably belong the Middle Danube axes, Kotowo type axes, and knobbed sickles with a high-arc blade form. Later elements are socketed axes with ornaments referring to the Przedmieście type of axes, Lusatian type sickles with pointed and rounded bases, the miniature sickles, and the tanged sickle. However, the overwhelming majority of later elements make it possible to place the time of deposition in Ha B2/Ha B3 (Orlicka-Jasnoch 2019).

Metalworker's Equipment?

The inventory of the Nowe Kramsko hoard includes metal items combined with casting products, given the presence of casting moulds and an object for producing casting moulds.

The two-part casting mould was used to cast socketed axes (Fig. 9.3: 1–2). The item's dimensions are: length 17.0 cm; socket outlet 5.2 cm × 5.4; bottom part width 5.2 cm; the item's weight is 1029.0 g (first half: 473 g; second half: 556 g). The mould allowed the production of undecorated axes, about 12 cm long. The axes belong to the Kowalewko type. These axes are primarily found in Lower Silesia but also in western Greater Poland, and single objects have been found in Pomerania, western Lesser Poland, and central Poland (Kuśnierz 1998, 30, table 43A; Orlicka-Jasnoch 2019, 26–28). It should be

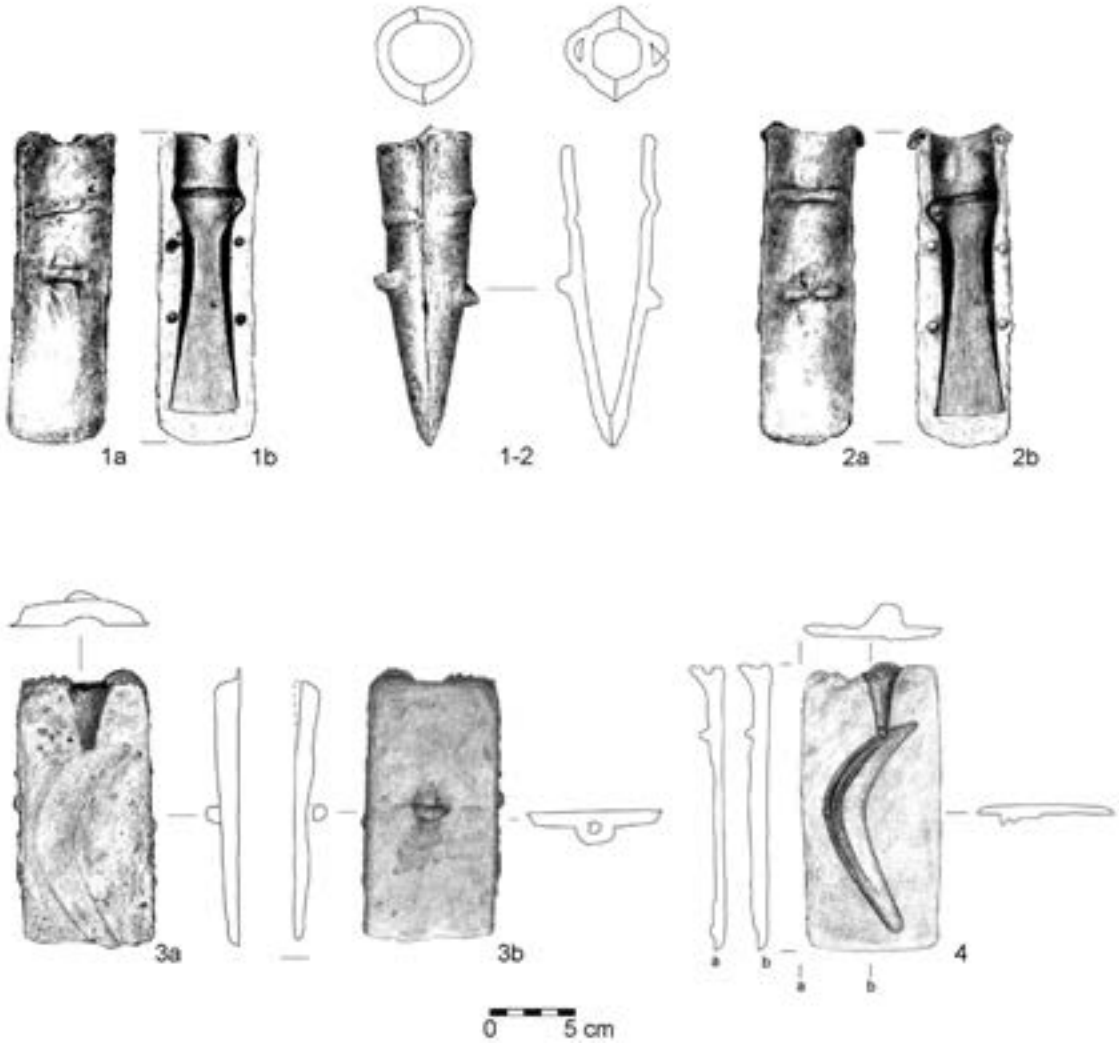


Figure 9.3. The metalworker's tool kit from the hoard inventory. Drawn by A. Sabak-Stachowiak (Orlicka-Jasnoch 2019, pls 12–14), prepared by K. Nowak.

noted that none of the axes discovered in the hoard were cast using this mould. Both parts of the mould were made of unalloyed copper, but with significant quantities of naturally occurring impurities (Kowalski and Garbacz-Klempka 2019, table 2).

The second artefact related to casting is the sickle mould (Fig. 9.3: 3). It is a lid that during casting covers the mould with the negative. The item is 13.2 cm long, 7 cm wide, 0.6–1 cm thick, and weighs 570 g. Inside, a shallow negative of the sickle is modelled (length: 10.4 cm, width: 2 cm) together with a more deeply recessed casting channel. In contrast to 'classic' moulds, the negative of the sickle is completely flat, without a modelled ridge, ribs, or knob. The outer sides of the artefact are uneven and rough, with visible metal overlaps. At the centre of the outer side is a handle, but without a hole. The tip of the sickle negative comes to the edge of the plate and does not end there, which may indicate an error in its manufacturing, a so-called 'misrun.'

Another metallurgy-related artefact is a rectangular metal plate with a convex Lusatian knobbed sickle with a thickened ridge and an additional single rib (Fig. 9.3: 4). Dimensions: length 13.5 cm, width 7 cm, and a maximum thickness of 0.8 cm. Weight: 463 g. The dimensions of the sickle model: length 10.4 cm; a width 2 cm; the width of the base is 0.5 cm; the height of the knob is 0.8 cm. Next to the knob, there is a convex casting channel reaching the edge of the plate. The sickle has been modelled very precisely. Both the ribs in the upper part of the ridge, the knob, and the casting channel are smooth, with no visible indentations or unevenness. Only the upper rib has a small defect. The outer surface is rough. To our knowledge, no analogies for this type of item are known in Europe.

Metalwork Production and Use-Wear Analyses

The study aimed to see if the artefacts in the hoard inventory had any traces of use. Traces related to their direct manufacturing were also analysed, such as traces of metal solidification, the presence of casting jets, pouring metal defects. The analysis focuses on the use-wear traces recently identified and described based on original artefacts and experimental research (Gutiérrez and Lerma 2015, table 9.1). The presence of striations (grinding or sharpening), forging, notches, breakages, dulled edges, or thickenings on the blade was noted. It is noticeable that the casting jets were removed from all the completely preserved objects analysed.

The primary goal of the research was to identify the presence of the above-mentioned use-wear traces in the case of fragments. Obtaining an answer to the question of whether the artefacts were used prior to deposition could reveal if they were not made solely for the purpose of fragmentation, or if they originally belonged to regularly used tools.

Macro- and microscopic examination of manufacturing and use-wear traces was performed on complete metalwork (fifteen axes, five spearheads, and forty-three sickles) and fragments (261 from sickles, axes, bracelets, spearheads, and undefined objects). The artefacts were observed before the conservation treatments (cf. Gutiérrez and Lerma 2015, 183; Sych and others 2020). Their surfaces had an intense green or light green patina. Sometimes, a layer of sand or soil covered a large portion of the items. These layers, in many cases, made it difficult to observe the whole surface, mainly in the case of small fragments. The summary of the manufacture and use-wear analyses is presented in Tables 9.1 and 9.2.

Microscopic observations were conducted at the Archaeological Museum of the Central Odra River Area in Świdnica using a portable Dino-Lite Digital Microscope with a 1.3 megapixel camera and magnification from 20× to 220×. Macroscopic photographs were also taken using a Nikon D3200 camera with a Tamron 90 mm F/2.8 Macro 1:1 lens.

The Complete Items

Socketed Axes

The traces on the entire surface of the fifteen socketed axes were analysed. Four of them bear traces of their use; the rest do not have these traces. Preparation for use in the form of various types of striations was observed on nine objects, and traces of production (casting seams and remnants of casting jets) were observed on all the objects. In the course of the analysis, nine axes were considered as-cast items, i.e., with completely unworked surfaces or with traces indicating their initial preparation for use (three axes) (Table 9.1).

On the socket edges of the eleven items, the remains of the removed casting jets are visible, allowing one to determine their number (most often two casting channels, less often one). Casting seams are preserved on all items, in some cases also on the cutting edge of the blade (nos 2, 4, 12, according to the *Catalogue of Finds* in Orlicka-Jasnoch 2019, 60–86). The preserved casting seams are usually smooth, dull, and rounded, with irregular indentations. Near the blade, they are removed or obliterated (Fig. 9.4: 1). In two cases of the axes of the Middle Danube type, the sides of the tools show traces of transverse grinding associated with the removal of the seams (Fig. 9.4: 6). On nine items, traces of solidification of the metal in the form of characteristic folds are visible. In the case of axe no. 11, the solidified metal perfectly reproduced the structure of the casting mould, creating irregular lines on its surface. The asymmetry of the two halves of the axes has been observed on many items. In some cases, the shift of the two halves of the mould during metal pouring is clearly visible (e.g., no. 13; Fig. 9.4: 6). For the production of axe no. 15, a casting mould consisting of two different halves or with a heavily damaged negative of the ornament on one of them was used. Casting defects are visible on the surface of twelve items.

Traces related to the preparation of the axes for use or possible repairs were observed on nine examples. The most common traces are striations and indentations on the blade surfaces. Regular and dense striations are the result of grinding. They run parallel, obliquely, or perpendicular to the blade's edge (e.g., no. 13; Fig. 9.4: 5).

Short oblique and perpendicular striations close to the edge of the blade, as well as indentations in the blade, can be considered use-related marks. Striations at the edge of the blade were observed on four items (e.g., no. 9; Fig. 9.4: 4). Small notches with clear plastic deformation of the metal on the blade cutting edge related to use are visible on two axes (e.g., no. 5; Fig. 9.4: 2), and a larger breakage with the loss of metal on one axe (no. 5; Fig. 9.4: 3). The blade of axe no. 11 is asymmetrical due to wear on one side. Forging has been observed on four axes. In the case of axe no. 10, these traces are clearly visible on the sides of the tool. In other cases, the forging is visible on the circumferential thickening of the socket in the upper part of the items.

Sickles

Forty-three completely preserved knobbed sickles were subjected to observation. Ten of them bear traces of use. Preparation for use (striations) was observed on

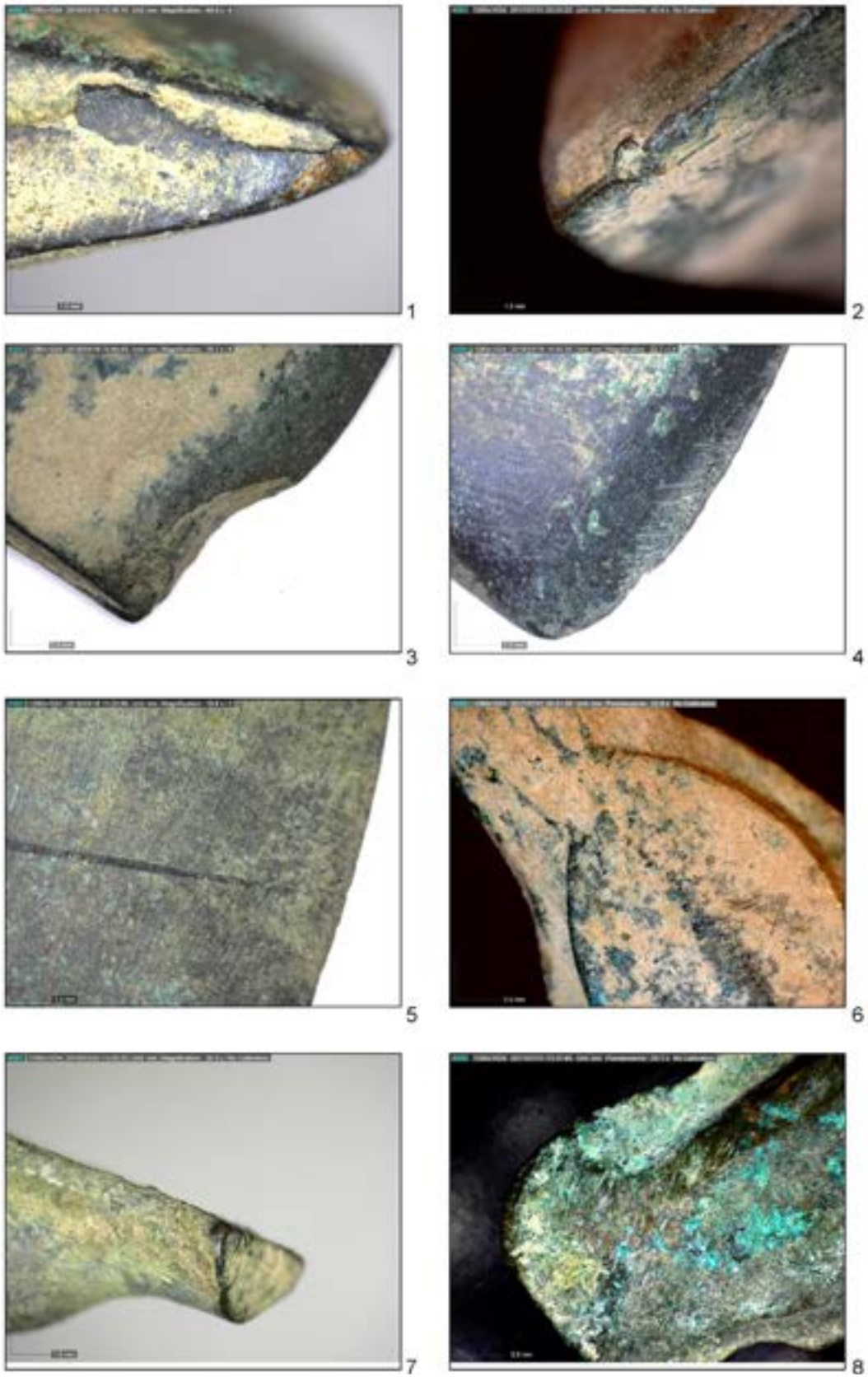


Figure 9.4. Traces of manufacture and use wear on the socketed axes and sickles. Photographs and preparation K. Nowak.

ten objects, and traces of production (casting seams and remnants of casting jets) on thirty-eight sickles. In the course of the analysis, twenty-nine objects were considered to be in as-cast state (including four with traces of initial preparation). It should be noted that the four sickles were very badly preserved, and therefore the analysis of their surfaces was difficult (Table 9.1).

Most sickles have visible remains of the casting seam (on the ridge and on the blade) and of the casting jet, located near the knob. Most of the casting jets were cut and broken off, as indicated by a straight cut line on one side (Fig. 9.4: 7) and an irregular edge on the other (cut on one side and broken at the marked place; Fig. 9.5: 3). Casting defects occurred in the case of twenty-two items.

No traces of forging or peening a sickle were identified. Traces related to grinding or sharpening were mainly observed as striations parallel or slightly oblique to the blade's edge, covering the entire surface of the tools. They were observed on ten items (e.g., Fig. 9.5: 1, 5). Parallel striations are found on several items with casting defects (Fig. 9.5: 5).

Use-wear-related traces were identified on ten sickles. These were small and barely visible or deep and long scratches, in a direction oblique or perpendicular to the blade's edge (Fig. 9.5: 2, 4). Most often, such marks are found in the central part of the blade. Sometimes (e.g., no. 56), the sickle shows traces of use in the middle part of the blade and a casting seam on its blade. The indentations and breakages in the blade are visible on fifteen sickles. It is difficult to clearly determine whether they result from deliberate or accidental actions. In the whole group, three indentations can be classified as deliberate notches. A blade with a blunt and rounded edge was observed in nine cases. It is worth noting that the rounded and blunt working edge of the sickle is the main determinant of its intensive use (McClendon 2015, 85).

Spearheads

Five fully preserved spearheads were analysed. Two of them bear traces of their use. Preparation for use was observed on three items, and traces of production were found on all of them. There were also three as-cast spearheads in the hoard inventory (including one with initial grinding traces).

In the case of most of the items, traces related to production are clearly visible. Five spearheads have unremoved casting seams, two casting defects (nos 73 and 74), and the remains of removed casting jets are visible on three spearheads. No. 73 can be considered a total casting failure as it has many casting defects and residues of what was probably a casting core inside the socket. Grinding is visible on the surfaces of three items (e.g., no. 72; Fig. 9.5: 6). Use wear in the form of notches or indentations in the blade appeared on two spearheads (nos 72 and 75). In the case of no. 75, there are visible traces of preliminary repair treatments (grinding) at the tip of the blade (Fig. 9.5: 7). The large crack in the lower part of its socket is most likely the result of using an object whose structure may have been weakened by a casting defect in the middle part of the leaf. Fracture due to deliberate fragmentation may also be considered.

The Metal Fragments

The largest part of the hoard inventory consists of highly fragmented items. These include fragments of axes, sickles, ornaments, and a fragment of a spearhead. The traces related to production, use, and fragmentation in the cases of sickles and bracelets are extremely interesting.

Sickles

One hundred and ninety-five fragments of knobbed sickles were subjected to observations. These include sickles with a broken tip of the blade or a broken base with the knob, as well as small fragments of sickles (tip, base, middle part). Only twenty-three of them bear traces of use. Preparation for use in the form of various types of striations was observed on thirty-six objects. Traces of production (casting seams and remnants of a casting jet) are on 128 objects. In the course of the observations, 116 objects were considered to be in an as-cast state (including twenty-three likely as-cast sickles and six items with initial grinding). The hoard inventory includes fourteen badly preserved fragments, making it impossible to conduct a detailed analysis.

Traces of production include traces of solidified metal (thirty-two sickles), casting defects (eighty-seven, of which three were complete casting failures), and casting seams (118, of which four are on the blade). The remains of the casting jet are preserved in sixty-four fragments.

It must be said that scratches present on small fragments covered with soil and deep corrosion are difficult to interpret unequivocally. The most characteristic are the regular longitudinal scratches observed on thirty-six items, also in the case of small fragments such as nos 131, 166, or 240. These traces can be combined with the preparation for use (grinding). The traces on the surface of twenty-three fragments were considered to be indisputably related to use. This includes regular scratches that are transverse or oblique to the blade's edge. Distinct indentations (notches) were observed on four sickle fragments.

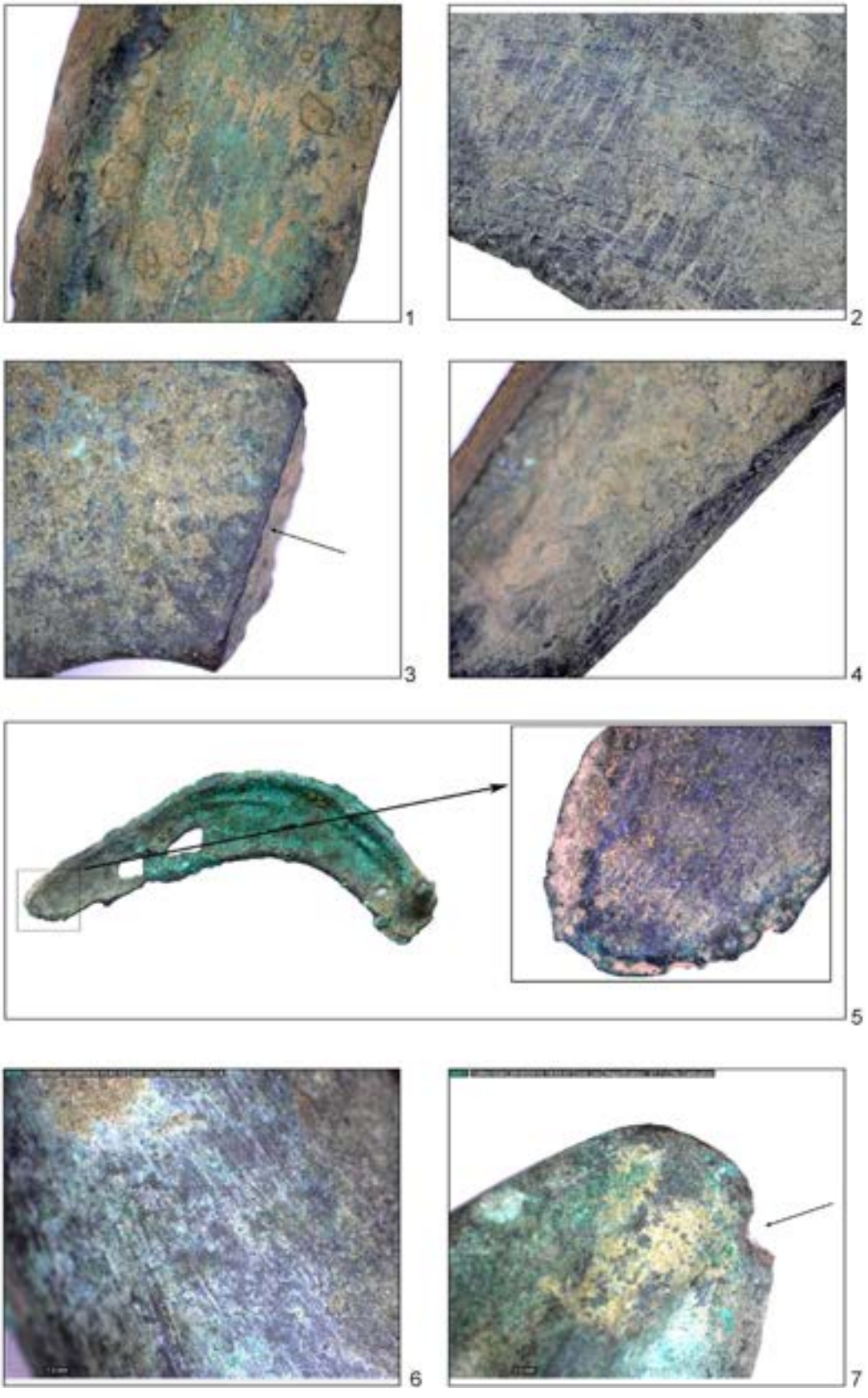


Figure 9.5. The manufacture and use-wear traces observed on the sickles and spearheads. Photographs and preparation K. Nowak.

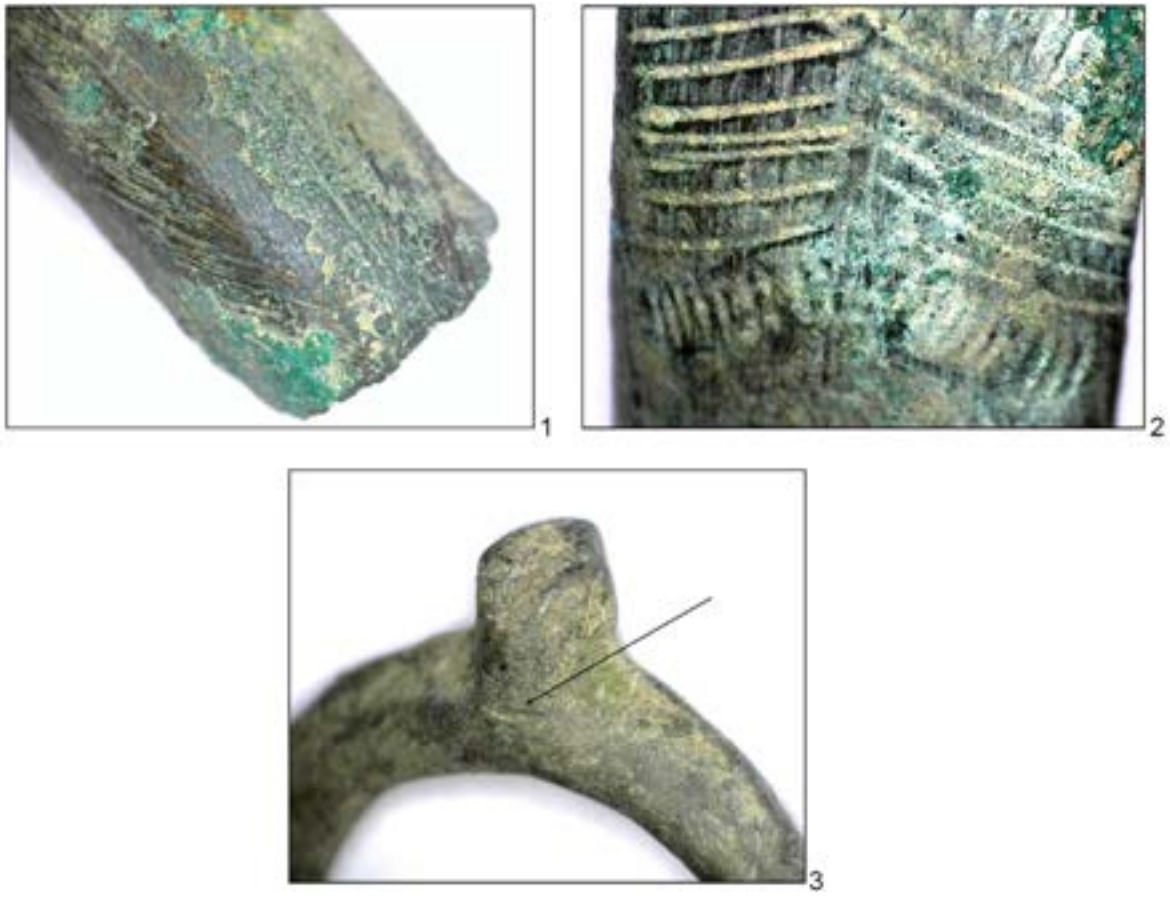


Figure 9.6. Ornaments: the preparation for use: grinding, decorating, separating of the casting jet. Photographs and preparation K. Nowak.

Ornaments

The second large group of fragments are ornaments, namely fragments of bracelets. When analysing the traces associated with the production of these items, the most characteristic is regular scratches remaining from grinding, observed on the surface of fifteen fragments. Grinding was performed along the bracelet, transversely to the edge of the fracture. In the case of bracelet no. 268, distinct coarse grinding covers the casting defects on the surface of the object (Fig. 9.6: 1). The surface of the ornamented bracelet no. 258 is completely covered with scratches, also on the ornament (Fig. 9.6: 2), which may indicate deliberate erasing of the ornament or may be evidence of some intensive use. In the case of bracelet no. 258, it is also possible to reconstruct the application of the ornament, which was applied with a chisel.

The other ornaments in the hoard inventory — two metal rings — bear traces related to production and preparation for use. The ring no. 285 has a casting seam and a small indentation at the base of the casting jet (chisel mark; Fig. 9.6: 3). The ring no. 286 has deep diagonal striations on one side, which are the result of surface grinding.

Traces of Fragmentation

Observation of the surfaces of metal objects allows us to determine the methods of their fragmentation. In the case of socketed axes and spearheads, the traces that indicate the division of objects into fragments are cracks and fractures. An impact with a heavy tool crushed the socket (no. 10; Fig. 9.7: 1) and, as a result, broke off fragments, the fracture of which has uneven, jagged edges, as can be seen on some complete objects (no. 7; Fig. 9.7: 2) and all the fragments of the axes (Fig. 9.7: 3–7). In the case of the spearheads, a similar treatment of the socket was most likely in the case of object no. 75. The tip of the as-cast spearhead no. 76 was chipped off by a strong impact (Fig. 9.7: 8). Hitting and crushing cause jagged fracture edges that are only visible on a few sickles (Fig. 9.7: 9–10).

In the case of sickles, the traces related to fragmentation are of a different nature. Only two sickles (nos 82

Figure 9.7. Smashing and crushing objects causes jagged and uneven fracture edges. Photographs and preparation K. Nowak.

and 84) show traces of cuts on two sides that have not met each other (Fig. 9.8: 1–2). A large part of the items has an even fracture edge, many times so even that it indicates the use of the tool with which the sickle was incised. Sommerfeld (1994, 34–35) wrote about this type of separation of fragments (Ger. *Sollbruchstelle*), which consisted of making a scratch or shallow cut with a saw or a chisel on one side of the object's surface. Nessel (2014) describes this type of mark as a 'separation with shape' technique made with a chisel or an axe for other types of object (casting cakes). Those 'sketches' indicated the location of a future fracture. It is extremely important for the reconstruction of this method of separating fragments that one side of the fracture is straight. In contrast, the other side is uneven and jagged, as is seen in many fragments from Nowe Kramsko, coming both from the middle parts (Fig. 9.8: 3–5) and tips (Fig. 9.8: 6–8). This indicates a deliberate use of some tool to make a shallow cut on one side (even side) and break off (jagged side) a deliberate part of the object. A very even fracture line rather indicates the use of a saw, but the use of a chisel cannot be ruled out in the case of items with less even fracture edges. However, we are unaware of any experimental work that has analysed the use of saws or chisels in making this type of initial incision. Using the method of heating and then breaking bronze objects is considered the most effective method of fragmenting. The traces of fragmentation of this type documented by M. Knight (2019, 10) and G. Lago and his colleagues (2023) on the replicas of the sword and sickles are not analogous to those observed on the sickles from Nowe Kramsko. Breaking the item after

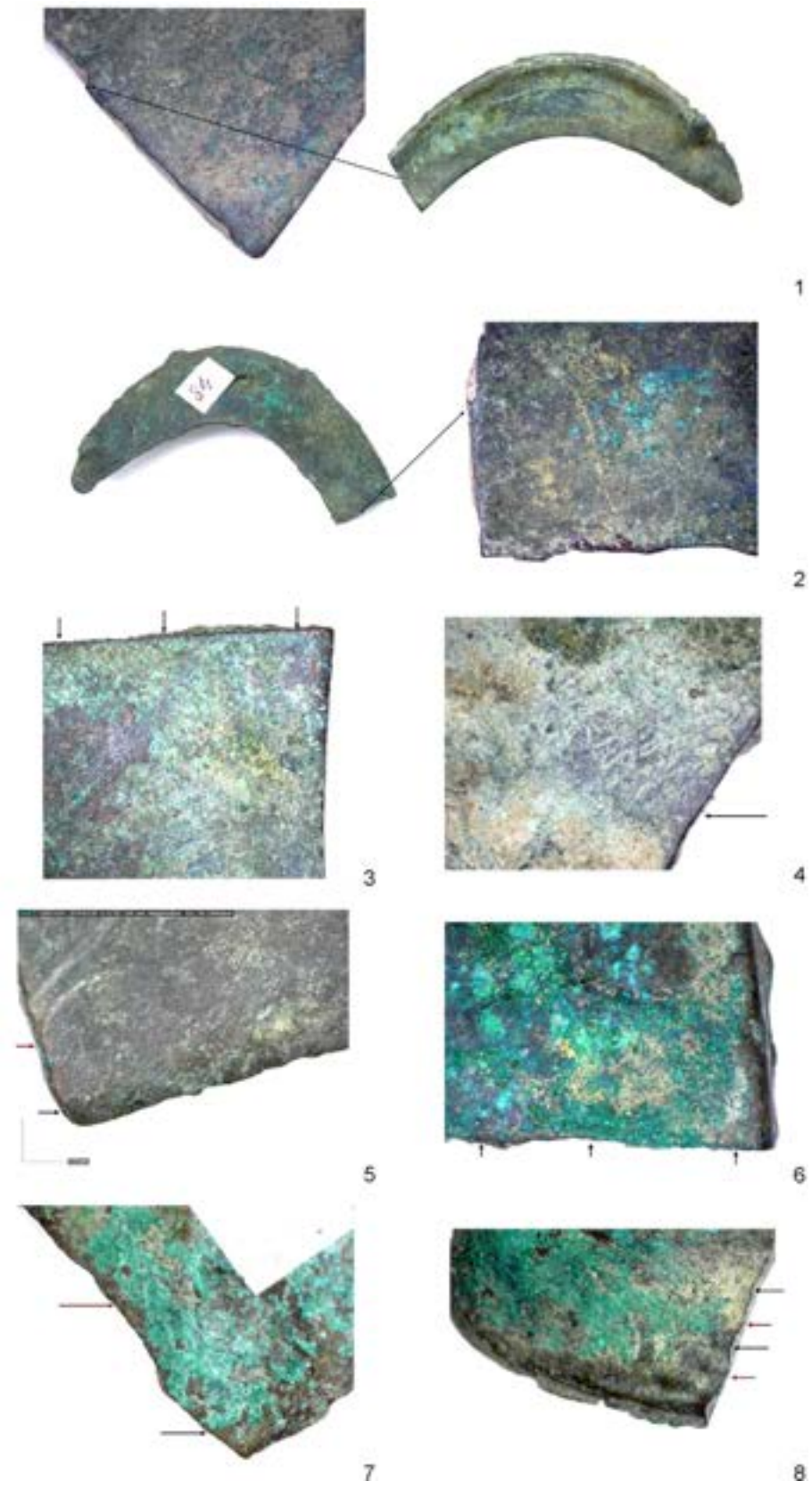


Figure 9.8. Traces of intentional and planned separation fragments from the sickles. Photographs and preparation K. Nowak.

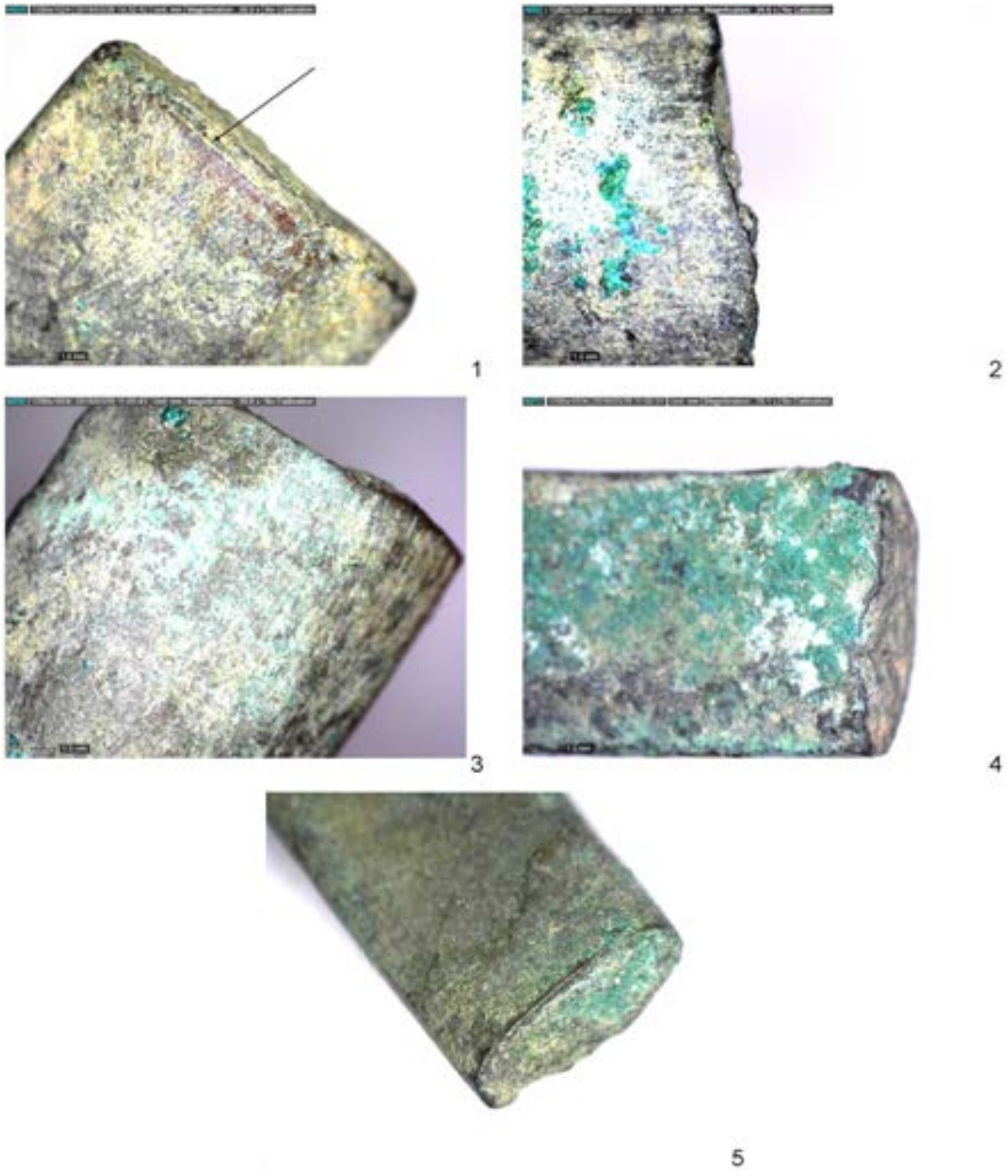


Figure 9.9. Traces of intentional and planned separating of the bracelet fragments. The arrow marks the saw cut. Photographs and preparation K. Nowak.

heating leaves a crack that is uneven and jagged (Knight 2019, figs 9–10). In the case of the sickles from Nowe Kramsko, the separation method was more complex.

Also, in the case of bracelet fragments, in most cases, the fracture edges are cut evenly on one side (Fig. 9.9: 1, 3, 4, 6), but this is not always the rule. In the case of bracelet no. 267, a fine transverse cut was observed at the edge, which indicates the use of a saw (Fig. 9.9: 1), but the other end was already irregularly broken (Fig. 9.9: 2). The fragment no. 266 was evenly separated on both ends, but irregular edges were formed upon breaking (Fig. 9.9: 3–4).

Looking for a Method in Fragments

The hoard from Nowe Kramsko is characterized by an exceptionally large number of small pieces of metal items — sickles, axes, bracelets, as well as lumps of raw material. The observations regarding the lack of traces of any use on a large portion of the hoard inventory are crucial. Most of the tools were considered to be in an as-cast state (Tables 9.1–9.2). This is evidenced by the casting seams on the blades, traces of metal solidification/shrinkage, uneven and thick edges of the blades (not related to use) and casting failures preventing use. Out of a total of sixty-five objects, forty-one were completely preserved and deposited in such an as-cast state. In the case of fragments, 133 pieces can be described as coming from raw castings (out of a total quantity of 243). Most of the sickle fragments (116 pieces, including twenty-three probably as-cast items) come from raw castings.

Bronze Fragments and Weight Systems

Recent research tends to disentangle circulation from deposition, rather than addressing them as separate problems. Numerous studies on the composition of hoards have revealed that there is no clear-cut ruleset that regulates their composition and that distinguishing between votive depositions, metallurgist stocks, and deposits of value is extremely difficult (Brandherm 2018). Alternatively, hoards can be seen as casual containers collecting random samples of all the metal that was circulating at the time of their deposition. Whether these collections were intended as gifts to gods, stocks of raw materials, or emergency reserves, is not something we can tell based on their composition alone. While this change in perspective does not help much in solving the 'hoards question', it opens up new ways to understand how commodities circulated.

Based on a comparison between silver in BA Mesopotamia, it has recently been proposed that bronze in BA Europe could have fulfilled a monetary function (Ialongo and Lago 2021). Bronze fragments from hundreds of hoards in Italy and Central Europe tend to comply with a widespread Pan-European weight unit of *c.* 10 g, reconstructed based on a large sample of balance weights. Nowe Kramsko provides the opportunity to test the same methodology on a single hoard, and to outline methodological guidelines for future research on the money hypothesis for prehistoric Europe.

We start from the assumption that the entire population of circulating fragments tends to comply with weight systems. Previous research has shown that the measurable outcomes of weight regulation are obscured by diffused background noise, and statistically significant patterns can only be seen with very large samples (at least seven hundred objects). For this reason, we do not expect to achieve statistically significant results with

Table 9.1. Use-wear, preparation, and manufacture traces on the complete objects. Prepared by K. Nowak.

Complete objects		**Use wear**			**Preparation for use**			**Manufacture (casting jets, seams, metal shrinkage)**			**As cast**
Object	**Quantity**				sharpening, grinding, forging						
		present	absent	undetermined	present	absent	undetermined	present	absent	undetermined	
Axes	15	4	11	0	9	6	0	15	0	0	9
Spearheads	5	2	3	0	3	2	0	5	0	0	3
Sickles	43	10	29	4	10	29	4	38	5	0	29
Ornaments	2	0	0	0	1	1	0	1	1	0	0

Table 9.2. Use-wear, preparation, and manufacture traces on the fragmented objects. Prepared by K. Nowak.

Fragments		**Use wear**			**Preparation for use**			**Casting seams/jets**			**As cast**
Object	**Quantity**				sharpening, grinding, forging, peening, hammering						
		present	absent	undetermined	present	absent	undetermined	present	absent	undetermined	
axes	20	0	20	0	3?	17	0	10	10	0	10 (incl. 3?)
spearheads	1	0	1	0	0	1	0	1	0	0	1
sickles	195	23	172	14	36 (incl. 4?)	159	14	128	67	0	116 (including 23?)
ornaments	27	0	27	0	15	12	0	5	22	0	6

the sample of Nowe Kramsko, which only contains 263 fragments. However, if the monetary use of fragments was quantitatively relevant in western Poland at the time of the deposition of the hoard, the sample should be big enough to show metrological patterns similar to the whole population.

Materials and Methods

Cosine Quantogram Analysis (CQA) allows one to determine if a sample of metrical observations is the product of an underlying unit, by looking for 'quanta' in a distribution of mass values. It tests whether an observed measurement x is an integer multiple of a quantum q plus a small error component ε. X is divided for q and the remainder (ε) is tested. Positive results occur when ε is close to either 0 or q, i.e., when x is (close to) an integer multiple of q:

$$\phi(q) = \sqrt{2/N} \sum_{i=1}^{n} \cos\left(\frac{2\pi\varepsilon_i}{q}\right)$$

where N is the sample size, and ϕ(q) is the test statistic (Kendall 1974).

The Nowe Kramsko hoard contains 264 fragments ranging from 1.14 to 120.08 g. For technical reasons depending on the mathematical formula — fully explained in a previous publication (Ialongo and Lago 2021) — only fragments weighing more than 7 g have been analysed, for a total of 168 objects.

Analysis

First, we compare the CQA results for the fragments in Nowe Kramsko to the results for the large sample of fragments from German and Polish hoards (control sample) already analysed in Ialongo and Lago 2021 (n=761). The objective of this comparison is to verify whether the quantal structure of the fragments of Nowe Kramsko is compatible with that of the control sample, i.e., to test the likelihood that metal objects were fragmented in order to comply with the Pan-European unit of *c.* 10 g. CQA shows that Nowe Kramsko produces a concentration of positive values in the same range of the control sample, between *c.* 8–12 g (Fig. 9.10).

A further test involves analysing the Nowe Kramsko sample together with the total Central European sample of fragmented objects, in order to verify if the quantal structure of the smaller sample is compatible with that of the larger one. This test is based on the principle that CQA sums the results of phi(q) for all the quanta analysed; hence, if the two samples are compatible, the values of phi(q) for the complete sample will be higher in the range of the theoretical unit of *c.* 10 g. Simply put, if the two samples are compatible, the analysis will give higher values for the range around *c.* 10 g. The results of the analyses meet the expectations, and show that the complete sample has the same quantal structure of the balance weights of Central Europe (Fig. 9.10).

Frequency Distribution Analysis (FDA) provides further insight into the CQA results of Nowe Kramsko. The binned distribution (bin width = 1.5 g) is overlaid by the phi(q) values for each measurement in the sample for a test quantum of 10 g (Fig. 9.10). The graph shows that CQA gives positive results for clusters of values at *c.* 10 g, *c.* 19–22 g, and *c.* 31 g. After *c.* 40 g, the sample is too spaced-out and does not show relevant clusters. FDA shows that a few clusters emerge that are compatible with the Pan-European unit of *c.* 10 g. It also shows that these clusters emerge, as expected, from a diffused background noise.

In conclusion, the statistical analysis of Nowe Kramsko supports the expectations for the compliance of fragmented metals with weight systems in Bronze Age Europe. In particular, it confirms that bronze fragments in European hoards tend to comply with the Pan-European weight system, and also that such a compliance is not compulsory but rather a customary trend, and that only with big samples is it possible to discern statistically relevant outcomes.

Discussion

The items included in the Nowe Kramsko hoard represent the entire spectrum of the hypothetical life cycle of metal objects: freshly cast complete items with casting defects, seams, and jets (n=41), items with traces of preparation for use (n=23), items with use wear (n=16). At the end of the operational chain there are fragments of objects of all categories (axes, sickles, spearheads, ornaments), which very often are in the form of raw castings (133 items out of a total of 243 fragments).

In the case of Nowe Kramsko, we are certainly dealing with the deliberate fragmentation of objects (mainly sickles and bracelets). We observed two main types of fragmentation. The first was to break objects along the cuts (the 'sketches') on the surface, and is mainly associated with knobbed sickles. This action was meant to make the fragmentation easier and, perhaps, to obtain fragments of specific shapes and predetermined mass values. The fractures are not analogous to those seen on experimental replicas that were broken due to overheating and hitting. For larger objects (socketed axes), the fragmentation has a different pattern. It was mainly done by smashing the object into pieces. Fragments with uneven and jagged edges indicate this type of action. In this case, we can see the similarities with experimental fragmentation which used high temperatures.

Combined analyses of preparation for use, use wear, and weight-based regulation provide the most interesting results.

Excluding ornaments, the analyses show that roughly 70 per cent of complete objects and 85 per cent of fragments show no traces of either use or preparation for use, thus indicating that, for the most part, the hoard contains raw castings. At the same time, CQA shows that a significant part of the fragmented sickles tends to comply with the Pan-European weight unit of *c.* 10 g. By combining these results, two patterns emerge: first, weight-based fragmentation occurs regardless of whether or not a given object is used or meant to be used; and second, most of the objects that were eventually fragmented were never used or meant to be used. If one accepts the hypothesis that weight-based fragmentation indicates the circulation of metals as currency, these data seem to suggest that, on the one hand, many objects were produced in order to be used as currency, on the other, that functional objects could also be eventually reused in monetary patterns of exchange. For the time being, the significance of these results is limited to the Nowe Kramsko hoard, and further research will be necessary to assess their validity on a regional scale.

Finally, the hypothesis that metals circulated as currency does not prevent the possibility that both fragments and complete objects could eventually be remelted, as the two functions are not mutually exclusive. As has already been suggested, the circulation of metal fragments was certainly not limited to metal workers, and we do not know how long a single fragment could have circulated before deposition (Ialongo and Lago 2021, 11).

Conclusions

In his recapitulation of the metalwork fragmentation issues in Late Bronze Age central Transylvania, B. Rezi (2011) indicates, based on the vast literature, that the presence of fragments in hoards can be associated with metallurgical (recycling), pre-monetary, and ritual actions. The results of our study on the Nowe Kramsko hoard show the potential of combining fine-grained analyses of use wear, preparation for use, and weight-based regulation on a large sample of bronze objects.

The emerging framework shows a complex interaction between different actions performed on metal objects, from casting to deposition. There seems to be a method in fragments. Regardless of whether or not the objects were used or meant to be used, many items (especially sickles) were accurately fragmented in a two-step procedure: first by applying a preliminary notch with a chisel or saw, and then by cutting off a

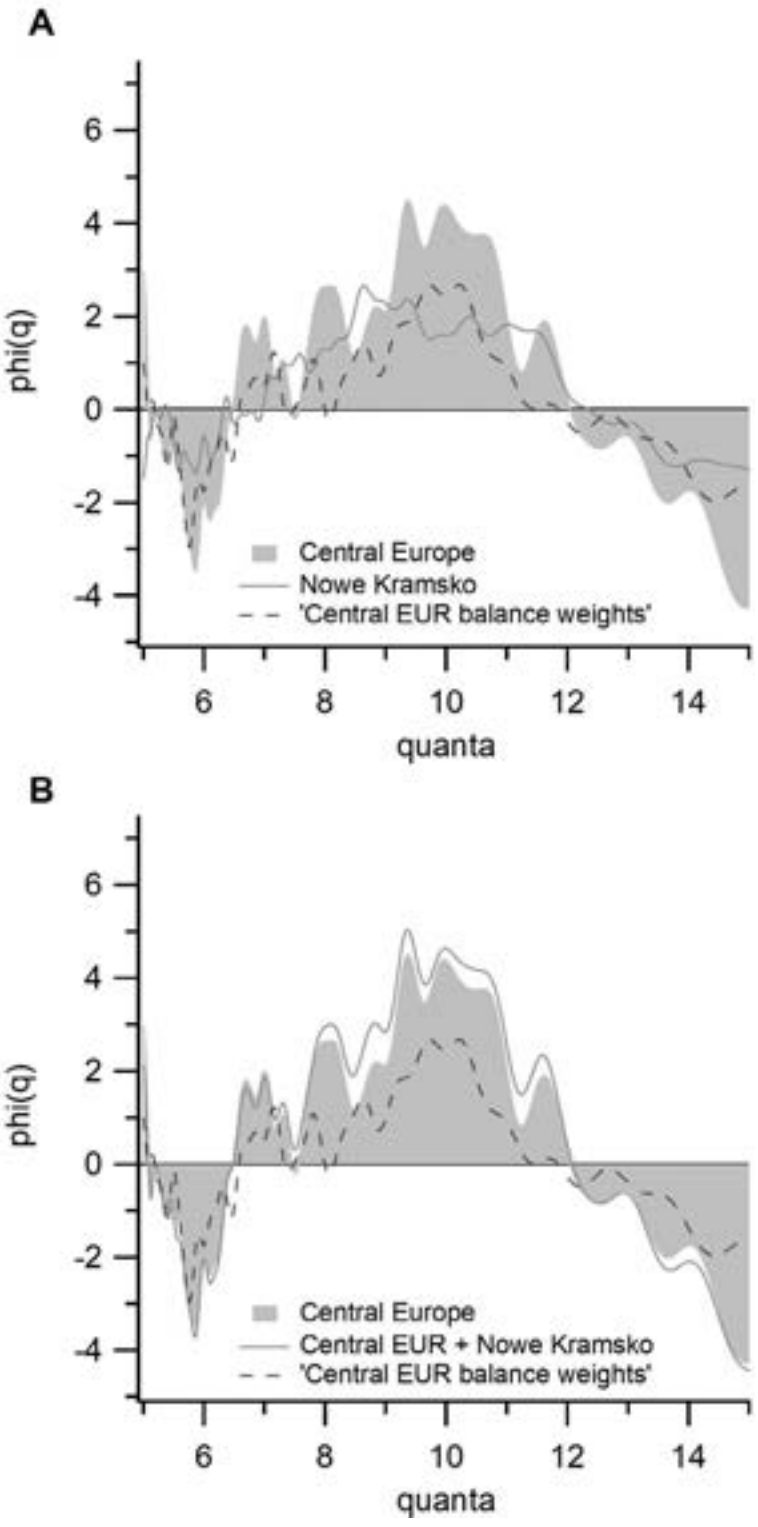


Figure 9.10. Cosine Quantogram Analysis (CQA). Analysis of bronze fragments and balance weights. A: Quantogram of the fragments of Nowe Kramsko is compared with the quantograms of balance weights and bronze fragments from in Central Europe. B: Quantogram of the total sample of fragments from Central Europe and Nowe Kramsko, compared with the quantograms of the fragments from Central Europe (without Nowe Kramsko) and balance weights. Data from Ialongo and Lago 2021. Preparation N. Ialongo.

piece with a precise blow. As the results of the statistical analyses show, this procedure was aimed at obtaining fragments with predetermined mass values.

Interestingly, none of these actions seems to be directly correlated to the act of deposition. Weight-based regulation only makes sense in the context of circulation. The 'monetary theory of fragmentation' can explain why objects were fragmented to be exchanged, but it cannot explain why these fragments were selected and ultimately buried in the ground.

The 'metallurgical theory' of fragmentation in order to melt down objects is tempting due to the presence in the hoard of additional utensils related to the metallurgical process. However, it appears that the precise dividing of fragments using precuts was not only related to recycling. The 'ritual theory of fragmentation', especially ritual violence toward the metalwork (Nebelsick 2000), cannot explain why hoards hardly ever contain matching fragments of the same object: if objects were broken apart to be ritually destroyed before their deposition, then at least part of the hoard's content would have had to have consisted of matching fragments. However, this is almost never the case (Ialongo and Lago 2021). The frequently proposed argument that ritual fragmentation would lead to the selective deposition of a single fragment (*pars pro toto*) while the rest would be dispersed and lost is problematic, as it relies on circular reasoning: the *pars pro toto* argument is, at the same time, the explanation as to why matching fragments are absent, and 'proof' that fragmentation is ritual (e.g., Chapman 2012, 63–104; Dietrich 2014; Hansen 2013). Moreover, the argument is indirectly invalidated by the fact that metal fragments tend to comply with weight systems, as it does not offer any explanation as to why this would be the case. The fragmentation-for-circulation hypothesis, on the other hand, is empirically supported by metrological analyses, while also providing a simple explanation for missing fragments: once an object is broken, its fragments circulate separately for an indefinite amount of time, until some of them are collected and buried (for whatever reason), others are recycled, and some others are simply lost. The 'random accumulation theory' — organically formulated for the first time in the context of British hoards of the LBA (Wiseman 2018) — represents an alternative to mainstream models that see the treatment of metal objects in hoards as some sort of ritual action, strictly connected with the act of deposition (e.g., Brück 2016; Hansen 2016). In this perspective, the Nowe Kramsko hoard would be simply a random collection of metal objects that were circulating at the time of its deposition.

In turn, the monetary theory of fragmentation leaves the question of the purpose of the deposition open. If fragmentation is only connected to circulation, it does not provide any clue to understanding whether hoards were deposits of value, metallurgists' stashes, or ritual depositions. All these hypotheses are equally viable, and hence the question remains open. Only the answer is not in the fragments. At the same time, our results urge further research on fragmentation as a key aspect of the circulation of metals in Bronze Age Europe.

Acknowledgements

We would like to thank Arkadiusz Michalak and Julia Orlicka-Jasnoch from the Archaeological Museum of the Central Odra River Area in Świdnica, for making the artefacts from Nowe Kramsko available for research.

The research was supported by the MKIDN Project (no. 03567/18) and the NCN Preludium 14 Project (no. 2017/27/N/HS3/01097).

Works Cited

Brandherm, Dirk. 2018. 'Fragmentation Patterns Revisited: Ritual and Recycling in Bronze Age Depositional Practice', in *Gifts, Goods and Money: Comparing Currency and Circulation Systems in Past Societies*, ed. by Dirk Brandherm, Elon Heymans, and Daniela Hofmann (Oxford: Archaeopress), pp. 45–65

Brück, Joanna. 2016. 'Hoards, Fragmentation and Exchange in the European Bronze Age', in *Raum, Gabe und Erinnerung: Weihgaben und Heiligtümer in prähistorischen und antiken Gesellschaften*, ed. by Svend Hansen, Daniel Neumann, and Tilmann Vachta, Topoi — Berlin Studies of the Ancient World, 38 (Berlin: Topoi), pp. 75–92

Chapman, John. 2012. *Fragmentation in Archaeology: People, Places and Broken Objects in the Prehistory of South Eastern Europe* (London: Routledge)

Dietrich, Oliver. 2014. 'Learning from "Scrap" about Late Bronze Age Hoarding Practices: A Biographical Approach to Individual Acts of Dedication in Large Metal Hoards of the Carpathian Basin', *European Journal of Archaeology*, 17.3: 468–86

Fontijn, David. 2020. *Economies of Destruction: How the Systematic Destruction of Valuables Created Value in Bronze Age Europe, c. 2300–500 BC* (London: Routledge)

Gutiérrez Sáez, Carmen, and Ignacio Martín Lerma. 2015. 'Traceology on Metal. Use-Wear Marks on Copper-Based Tools and Weapons', in *Use-Wear and Residue Analysis in Archaeology*, ed. by João Manuel Marreiros, Juan Francisco Gibaja Bao, and Nuno Ferreira Bicho, Manuals in Archaeological Method, Theory and Technique (Cham: Springer), pp. 171-88

Hansen, Svend. 2013. 'Bronze Age Hoards and their Role in Social Structure: A Case Study from South-West Zealand', in *Counterpoint: Essays in Archaeology and Heritage Studies in Honour of Professor Kristian Kristiansen*, ed. by Sophie Bergebrant and Serena Sabatini, British Archaeological Reports, International Series, 2508 (Oxford: BAR), pp. 179–91

——. 2016. 'A Short History of Fragments. Material Culture and Identity between the Mediterranean World and Central Europe', in *Materielle Kultur und Identität im Spannungsfeld zwischen mediterraner Welt und Mitteleuropa: Akten der Internationalen Tagung am Römisch-Germanischen Zentralmuseum Mainz, 22.-24. Oktober 2014*, ed. by Holger Baitinger (Mainz: Verlag des Römisch-Germanischen Zentralmuseums), pp. 22–24

Ialongo, Nicola, and Giancarlo Lago. 2021. 'A Small Change Revolution. Weight Systems and the Emergence of the First Pan-European Money', *Journal of Archaeological Science*, 129: 105379

Kendall, David George. 1974. 'Hunting Quanta', *Philosophical Transactions of the Royal Society of London: Series A, Mathematical and Physical Sciences*, 276: 231–66

Knight, Matthew G. 2019. 'Going to Pieces: Investigating the Deliberate Destruction of Late Bronze Age Swords and Spearheads', *Proceedings of the Prehistoric Society*, 85: 251–72

——. 2021. 'There's Method in the Fragments: A Damage Ranking System for Bronze Age Metalwork', *European Journal of Archaeology*, 24.1: 48–67

Kowalski, Łukasz, and Aldona Garbacz-Klempka. 2019. 'Badania metaloznawcze skarbu z Nowego Kramska', in *Skarb z Nowego Kramska Analizy: Konteksty*, ed. by Arkadiusz Michalak and Julia Orlicka-Jasnoch (Zielona Góra: Muzeum Archeologiczne Środkowego Nadodrza w Zielonej Górze), pp. 139–78

Kuśnierz, Jerzy. 1998. *Die Beile in Polen, III: (Tüllenbeile)*, Prähistorische Bronzefunde, 9.21 (Stuttgart: Steiner)

Lago Giancarlo, Matteo Cianfoni, Federico Scacchetti, Luca Pellegrini, and Andrea La Torre. 2023. 'Breaking Sickles for Shaping Money. Testing the Accuracy of Weight-Based Fragmentation', *Journal of Archaeological Science: Reports*, 49: 103968

McClendon, Barbara Ellen. 2015. 'The Sickle's Edge: An Experimental Use-Wear Approach to Investigating Sickle Deposition in Bronze Age Europe' (unpublished doctoral thesis, University of Wisconsin-Milwaukee) <https://dc.uwm.edu/etd/1035/> [accessed 4 September 2024]

Michalak, Arkadiusz, and Julia Orlicka-Jasnoch (eds). 2019. *Skarb z Nowego Kramska: Analizy. Konteksty* (Zielona Góra: Muzeum Archeologiczne Środkowego Nadodrza w Zielonej Górze)

Nebelsick, Louis. 2000. 'Rent Asunder: Ritual Violence in Late Bronze Age Hoards', in *Metals Make the World Go Round: The Supply and Circulation of Metals in Bronze Age Europe*, ed. by Christopher F. E. Pare (Oxford: Oxbow), pp. 160–75

Nessel, Bianka. 2014. 'Bronze Age Portioning of Raw Material-Concepts, Patterns and Meaning of Casting Cakes', in *Carpathian-Heartlands: Studies on the Prehistory and History of Transylvania in European Contexts, Dedicated to Horia Ciugudean on his 60th Birthday*, ed. by Nikolaus Boroffka, Gabriel Tiberiu Rustoiu, and Radu Ota, Apulum, Archaeologica et anthropologica, 51 (Alba Iulia: Muzeul Național al Unirii), pp. 401–16

Orlicka-Jasnoch, Julia. 2019. 'Skarb ludności kultury łużyckiej z Nowego Kramska. Aspekt archeologiczny', in *Skarb z Nowego Kramska Analizy: Konteksty*, ed. by Arkadiusz Michalak and Julia Orlicka-Jasnoch (Zielona Góra: Muzeum Archeologiczne Środkowego Nadodrza w Zielonej Górze), pp. 17–138

Rezi, Botond. 2011. 'Voluntary Destruction and Fragmentation in Late Bronze Age Hoards from Central Transylvania', in *Bronze Age Rites and Rituals in the Carpathian Basin*, ed. by Sándor Berecki, Rita E. Németh, and Botond Rezi (Târgu Mureș: Mega), pp. 303–34

Sommerfeld, Christoph. 1994. *Gerätegeld Sichel: Studien zur monetären Struktur bronzezeitlicher Horteimnördlichen Mitteleuropa*, Vorgeschichtliche Forschungen, 19 (Berlin: De Gruyter)

Sych, Dawid, Kamil Nowak, Marcin Maciejewski, Beata Miazga, and Justyna Baron. 2020. 'Influence of Conservation of Copper and Bronze Artefacts on Traces of Production and Use-Wear', *Archaeological and Anthropological Sciences*, 12: 141

Wiseman, Rob. 2018. 'Random Accumulation and Breaking: The Formation of Bronze Age Scrap Hoards in England and Wales', *Journal of Archaeological Science*, 90: 39–49

SZILVIA GYÖNGYÖSI, LAURA JUHÁSZ, PÉTER BARKÓCZY,
JULIANNA CSEH, AND GÉZA SZABÓ

10. Comparative Technological Analysis of Middle Bronze Age Bronze Objects from Hoards and Burials

▾ **ABSTRACT** The rich and varied bronze finds from the burials and hoards of the Transdanubian Encrusted Pottery Culture and Early Tumulus Culture, discovered in a smaller geographical area around Tatabánya (Hungary, Komárom-Esztergom County), provided a good opportunity for the comparison of the metalwork of the two successive periods, including the possibility of observing the similarities and differences between items from hoards and the grave goods from burials.

The SEM-EDS chemical composition analysis focused on two directions: the results of the average (field) composition analyses allowed the classification of the samples. With phase analyses, the present phases could be identified, which were used as additional information for the metallographic examinations. During the metallographic examination, the microstructure analysis provided information mainly about the manufacturing process, including the question of whether the object was made by casting, plastic deformation after casting, or perhaps subjected to heat treatment after the metal was shaped. Additionally, the corrosion processes could also be followed even after the objects had fallen out of use. Data and observations indicated the application of different raw materials and diverse technologies. Evaluating these together with the excavation observations and historical background, the differences between the two consecutive periods were well established, both in terms of the raw materials, as well as methods used in the processing of the bronze.

A comparison of the bronze objects of the hoards and burials also revealed that differences are likely to be observed, not only related to the types according to function (tools/ornaments), but

Szilvia Gyöngyösi • University of Debrecen, Hungary (szilvia.gyongyosi@eng.unideb.hu)
Laura Juhász • University of Debrecen, Hungary (juhaszlaura21@gmail.com)
Péter Barkóczy • University of Miskolc, Hungary (peter.barkoczy@uni-miskolc.hu)
Julianna Cseh • Museum of Tatatbánya, Hungary (juci.cseh@gmail.com)
Géza Szabó • Wosinsky Mór Museum, Szekszárd, Hungary (szabo.geza@womm.hu)

Hoards from the European Bronze and Iron Ages: Current Research and New Perspectives, ed. by Marcin Maciejewski, János Gábor Tarbay, and Kamil Nowak, NAA, 4 (Turnhout, 2024), pp. 149–169.
BREPOLS PUBLISHERS DOI 10.1484/M.NAA-EB.5.142442

especially the ritual of the burial in connection with the disposal of the jewellery.

▾ **KEYWORDS** Middle Bronze Age, Encrusted Pottery Culture, Early Tumulus Culture, bronze, hoard, SEM-EDS, metallography

Introduction

Recently, several metal objects have been analysed from Middle Bronze Age (2000–1600/1500 BC) hoards and burials belonging to the Encrusted Pottery Culture (EPC) of Transdanubia. The test results showed a significant discrepancy between the accumulated, hidden tools and ornaments from hoards and the typically burnt items found in cremation graves. The differences, mainly in the microstructure, can be partly explained by the rite, however, for some object types there was consistently no trace of them being placed on the pyre, while for others, even within a single hoard, traces of burning could be observed. Therefore, the question arose whether a group of objects were treated separately during the funeral, and if so, what the reasons for this might have been.

In these archaeometric investigations, two different types of hoard, and the bronze objects of a cremation rite were compared. In the Vértesszőlős hoard, the characteristic women's ornament of the Transdanubian EPC was found, while the Zalaszabar artefact collection of similar age included a mixed composition of weapons and ornaments, and the cremation rites of the Bonyhád cemetery only contained ornaments with one exception.

The Examined Objects and their Archaeological Contexts

The Vértesszőlős Hoard

In the northern part of Transdanubia, in the foothill of Gerecse and curving towards the Danube, the Által stream has been a natural route for connections on the west–east axis for thousands of years. Situated on the terraces accompanying the watercourse, the village of Vértesszőlős (Komárom-Esztergom County) is primarily known among researchers of the period for its Late Bronze Age cemetery (Fig. 10.1). Bronze Age finds were found mainly on the second terrace of a hillside that rises from a swampy area, often flooded. Thanks to the results of continuous excavations and on-site inspections since 2005, with occasional interruptions, details from the site and cemetery, as well as scattered bronze objects enrich our knowledge of the area. Excavations under the leadership of Gabriella A. Pál (collaborator: Julianna Kisné Cseh) in 2009 have revealed the details of the cemetery, the use of which started in the Koszider period, and a Middle Bronze Age symbolic grave or pit, and several scattered ornaments and a fragment of a dagger. In addition to the known ornament type of EPC, the scattered material contained fragments of various types of pendants, spiral tubes, bronze dandelions, and a bronze dagger. Of the eight graves excavated so far, three were cremations, one was symbolic, and the rest were inhumation burials. All of the latter graves were disturbed. In 2016, ornaments belonging to the hoard were donated to the collection of the Tatabánya Museum from the agricultural area north of the site, where the mound-grave cemetery also continues.

The site has produced the mentioned hoard. This includes seventy-five bronze objects: two disc-headed pin, nineteen perforated, pierced pendants, and eighteen crescent-shaped pendants, twenty-seven hemispherical studs, and eight spiral beads wound in four–twenty turns of wire and a separate unnumbered fragment. Unfortunately, the exact circumstances of the discovery of the finds are not known.

The Zalaszabar Hoard

On the border of Zalaszabar (Zala County), which belongs to the western part of Transdanubia (Fig. 10.1), fifty-five bronze objects were found during tree planting in the infilled part of Kis-Balaton in 1998, then the following year additional finds were found during agricultural work, which can be partially combined with the previous ones. Thus, a total of eighty-three intact and fragmented objects of the hoard weighing about 1.5 kg were added to the collection of the Rippl-Rónai Museum in Kaposvár. Except for two objects, the finds were ornaments: eleven disc-shaped pendants, thirty-two intact and fragmentary, perforated centre-holed pendants, two comb-shaped pendants, twelve inverted heart-shaped pendants, two crescent-shaped pendants, two spectacle spiral pendants, fourteen beads made of spirally wound plate or wire, a fragment of a double-coiled bead twisted from a plate, three disc-headed pins, a spiral arm ring, and a fragment of a necklace with a curved end. Unfortunately, due to the circumstances of the discovery, it is not known how closely the two additional objects, a flanged axe, and a pin, are related

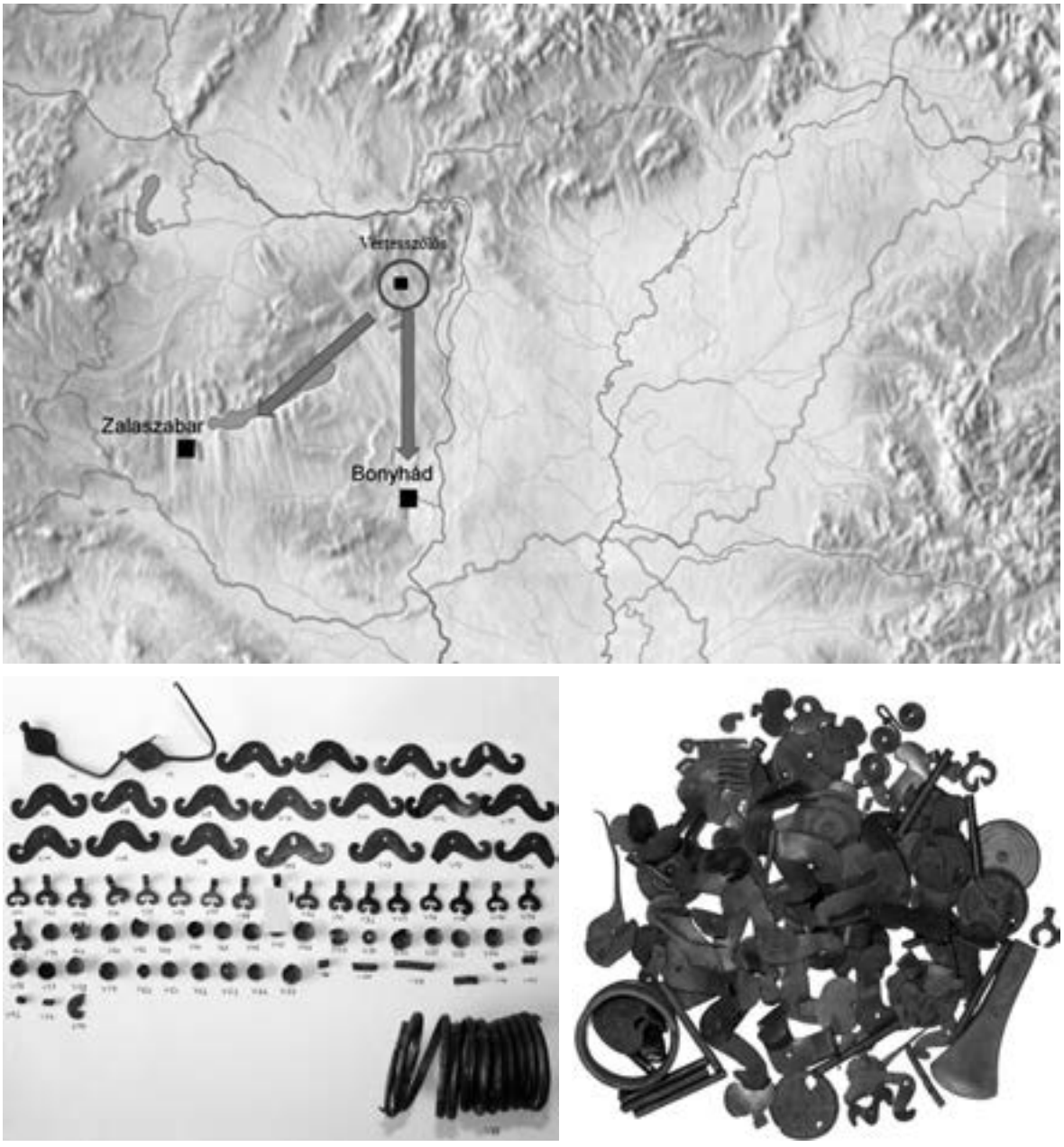


Figure 10.1. The location of the hoards and cemetery (a) and objects from the different hoards: cemetery of Vértesszőlős (b) and Zalaszabar hoard (c). Created by the authors.

to the ornaments (Honti and Kiss 2013). Similar hoard finds typically found in the EPC are considered in the literature as Tolnanémedi–Lengyeltóti type hoard groups (Bóna 1958; Mozsolics 1967; Kiss and others 2013; Kiss and others 2013). Based on the results of the Studien zu den Anfangen der Metallurgie project (Junghans and others 1968), Kiss (2009, 200–01, figs 7–8; Kiss and others 2013, 73) concluded that about four-fifths of the ornaments of the hoards similar to Zalaszabar are made of the so-called Ösenringkupfer metal type, which can be linked to high arsenic, silver, and antimony ores connected to the Czech-Saxon Ore Mountain–eastern Alps–central Slovak Ore Mountains.

The Bonyhád-Biogas Factory, Mixed Rite Cemetery

On the border of Bonyhád (Tolna County), on the eastern side of the road to Varasd, in the autumn of 2008, during the archaeological excavation prior to the construction of a biogas power plant, 161 tombs of the EPC were excavated (Fig. 10.1). During the excavation,

it became evident that József Csalog had investigated part of this site in 1936–1938 (Csalog 1942, 119; Szabó 2009), and it was possible to identify the location of the twenty-three graves he excavated, thus adding to a total of 184 burials from the site (Szabó 2009, fig. 1.1). The larger and richer EPC finds are also exceptional in that they follow the burial habits of the period from the end of the Early Bronze Age to the beginning of the Late Bronze Age (RBz A–B1 ≈ 2150–1600/1500 BC) and the changes in the shape and decoration of the vessels (Szabó 2017, 108, fig. 5; Hajdu and others 2016). The decorations on the vessels placed next to the body during inhumation burials, and later cremations, were shown to be essentially part of a sign system relating in some way to the deceased for example the role, gender, age, etc. (Szabó and Hajdu 2011, figs 6–7; Hajdu and others 2016). Considering observations made during the excavation of inhumation burials and reconstructions based on vessels and contemporary idols, it can be clearly shown that some of the objects seen in the hoards described above were ornaments for the head (studs) and the neck (inverted heart, crescent, spectacle spiral pendants, spirally wound beads, necklaces with curved ends), the disc-headed pin was used to hold the garment together, while the disc-shaped pendants and the pendants with curved ends, perforated in the widening centre, were elements sewn into the garment. It is also interesting from this point of view that the latter object types were not found in the graves in Bonyhád, while the head and neck ornaments of the approximately two dozen known hoards (studs, inverted heart, crescent-shaped pendants, spirally wound beads, necklaces with curved ends) were found in many graves. This type of distribution of hoards and grave attachments is typical of the whole EPC, with disc-shaped pendants sewn onto the garment, and pendants with curved ends perforated in the middle of the widened part were noticeably rare, as exemplified by Vörs-Papkert 'B' grave CXI (Kiss 2012, pl. 63. 7–9).

Among the ornaments sewn onto the garment, bifurcated pendants with a thickened middle perforated in the middle and with outwardly turned curved ends are known variously in the literature as anchor-, dovetail-, or moustache-shaped pendants. This clearly indicates that there is complete uncertainty not only about the name of the object type, but also in its possible role. However, to clarify the possible reasons for hiding the objects and to interpret the clearly visible differences between the composition of grave goods and hoards, it would be essential to clearly define the role of this type of pendants. We have already pointed out that in terms of their structure these pendants (wider in the middle, tapering towards the ends and in opposite directions, but always ending in a mirror image and turned outwards), can be traced back to a specific natural image: their shape mimics the cow's uterus (Szabó and others forthcoming). Their meaning can be traced back to Mesopotamia from the middle of the fifth millennium BC, the Ubaid period, where Ninhursag, the mother goddess responsible for birth, is often depicted with the symbol omega (Ω), representing the organ. Often the goddess is symbolized with the omega placed on an altar only (Black and Green 1992, 132, fig. 109, 138, 146, fig. 119). It is more accurate and expressive to refer to the pendant as a uterus-shaped ornament (or even more clearly referring to its meaning), but it is more objective to label it an omega-shaped ornament — as it will be referred to in this study.

Metallographic Tests

The purpose of metallographic examinations is to answer questions related to the chemical composition and microstructure of the objects. The SEM-EDS study focuses on two directions: 1, classification of the samples with an average area composition analysis and 2, identification of the phases that may be present. The phase analysis can provide additional information for the metallographic examination. During the metallographic examination, the microstructure analysis provides information mainly about the manufacturing process, which includes the question of whether the object was made by casting or plastic deformation after casting, or perhaps subjected to heat treatment. More importantly, by examining corrosion processes, we can trace the life cycle of objects even after they have fallen out of use. In the present case, the average chemical composition of each sample was determined by SEM-EDS and, in some cases, phase analysis was performed.

Objects are included in the scope of metallographic examinations from each site, investigating both the different types of object and their various manufacturing processes. Due to the protection of the artefacts, samples can only be taken in the most necessary case, ensuring minimal damage. Due to the small size of the finds, in most cases one of the characteristic points must be embedded in a two-component, cold-setting Dentakryl resin. However, in the case of spiral beads and arm spirals, sampling is only possible from the end of the object to cover its entire cross-section, ensuring that traces of possible manufacturing and heat treatment processes could be examined in full during the microstructure analysis.

The objects included in the scope of the present study from the hoard of Vértesszőlős are: bronze pin V2, crescent-shaped pendant V29, bronze hemispherical stud V40, omega-shaped pendant V64, spiral arm ring V75, unnumbered fragment of spiral beads (Kuny Domokos Museum, Tata, inv. no. 4.1.1–19). From the analysis

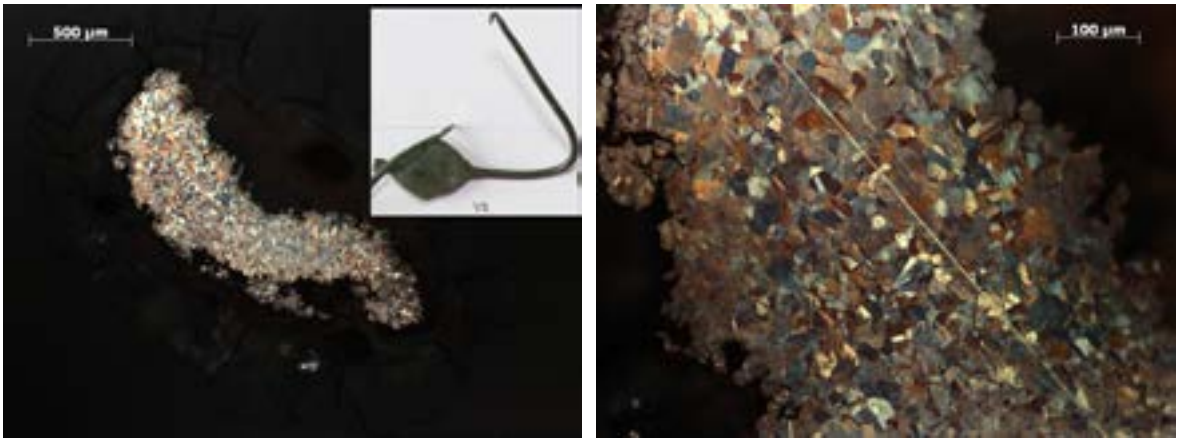


Figure 10.2. Micrographs of bronze needle V2 from the Vértesszőlős hoard. Sample prepared by K_2CrO_4 and photos taken in polarized illumination. Created by the authors.

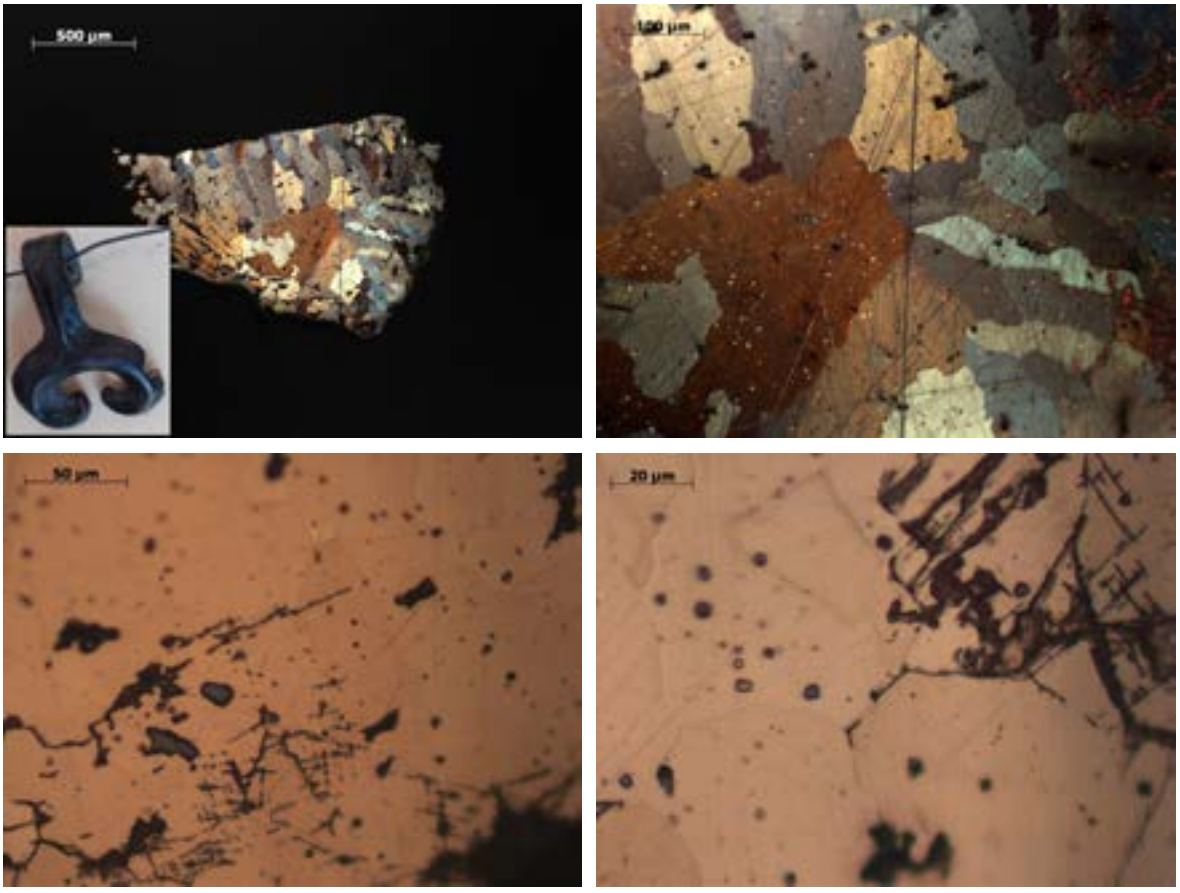


Figure 10.3. Micrographs of pendant V29 from the Vértesszőlős hoard. Sample prepared by etching in K_2CrO_4 and photos taken in polarized illumination (a, b) which show the grain structure. Sample etched by $FeCl_3$ and photos taken in bright field illumination (c, d). In these pictures the inclusions can be seen.

data of the previously examined objects of Zalaszabar (Rippl-Rónai Museum, Kaposvár, inv. no. 2010.2.1–83, Kiss and others 2013) this time we highlight only the data related to the exploration of the particle and phase structure in eight objects in the LISA laboratory of the Institute of Materials Science of the University of Miskolc (omega-shaped pendant 2010.2.1.21, 2010.2.1.27, 2010.2.39; inverted heart-shaped pendant 2010.2.1.48;

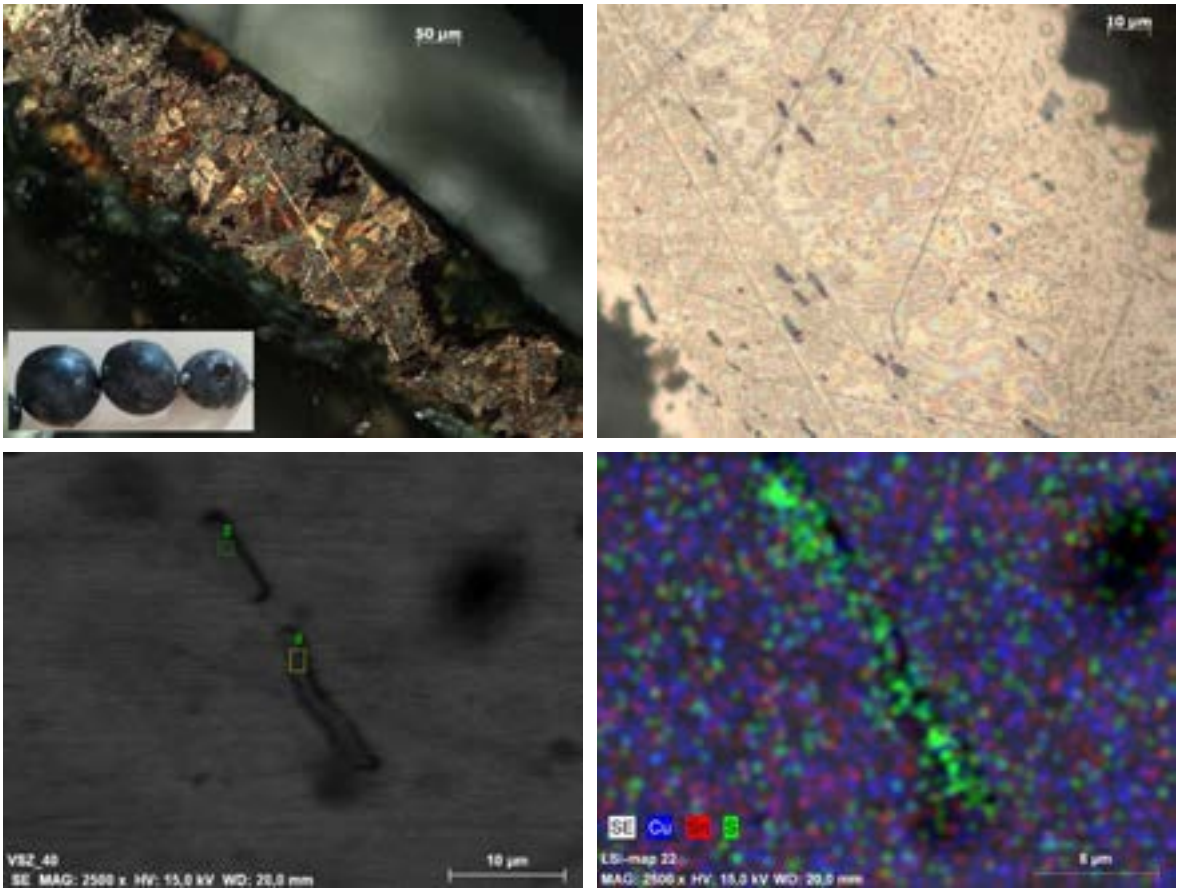


Figure 10.4. Micrographs of hemispherical stud V40 from the Vértesszőlős hoard. Sample prepared by etching in K_2CrO_4 and photos taken in polarized illumination (a). Recrystallized grain structure can be seen on the photo with medium-sized grains. Small elongated CuS inclusions can be found in the sample after $FeCl_3$ etching in bright field illumination (b). SEM photo and element map show the CuS inclusions in larger magnification (c, d). Created by the authors.

crescent-shaped pendant, 2010.2.1.59; spectacle spiral pendant 2010.2.1.61; plate bead 2010.2.1.71; disc headed pin 2010.2.1.78). Among the grave goods of the Bonyhád cemetery, in connection with the types of object found in the hoards, our investigations focused on three main types of object: spiral arm rings (BQ31J3, BQ200J4–6, BQ151J12), and inverted heart-shaped pendants (BQ114J4, JQ174J4, JQ174J4).

Examined Samples, Test Results

The Vértesszőlős EPC Hoard

Bronze Pin V2

The pin is made from a common tin bronze with ~4.6w / w% tin content. This alloy is suitable for cold plastic deformation, however the hardness of the alloy is high, and the strain hardening is intensive, so annealing was necessary to create the pin-like shape. A recrystallized grain structure can be seen on Fig. 10.2 with a small grain size (~20µm). The small grain size implies high recrystallization temperature and a relatively large extent of deformation. In addition to the tin the alloy contains arsenic and phosphorus in around 1w / w% (Table 10.1). Both constituents affect the mechanical properties to a larger extent. More objects have arsenic content, but the phosphorus content makes this object unique in the examined ones. There is a deep corrosion layer on the pin, as a result only the central area of the cross-section can be examined. The annealed small-grain-sized microstructure and the chemical composition suggest the same grain structure in the original cross-section. The metallic part and corrosion products show a general corrosion process. Small-sized copper sulphide inclusions can be found in the microstructure.

Crescent-Shaped Pendant V29

The microstructure reveals a cast tin-bronze (Fig. 10.3: a). The tin content of the pendant is ~5.6w / w%; in

addition, arsenic (1.64w / w%) and nickel (0.67w / w%) content was detected (Table 10.1). This could be regarded as a typical alloy type of the examined objects. The arsenic content has a larger effect on the properties of the bronze material than the nickel content. The section shows a typical microstructure of cast alloys. Small grains can be observed next to the surface which came into contact with the mould, where the cooling rate was the highest. Due to the dimensions of the pendant, the cooling rate was also high during the whole crystallization process, and as a result, a large part of the cross-section is built up from a columnar dendritic structure. Coarse uniaxial dendritic grains can be observed in the middle of the cross-section (Fig. 10.3: b). This composition is not ideal for casting due to the low tin content. A higher tin content means lower liquidus and solidus temperature. But for the present small object (dimensions and shape) this alloy was cast by fine technique. Just a small corrosion layer can be found on the surface of the object, which suggests a general corrosion process. A few larger and several small globular copper sulphide inclusions can be seen in the microstructure. The globular inclusions also suggest a high temperature production technique.

Bronze Stud V40

The tin content of the bronze stud is lowest among the hoard items (3.44w / w%). In addition to tin, a small amount of arsenic was detected (0.4w / w%). This alloy can also be considered as a type among the objects examined (Table 10.1). The low tin content is considered advantageous in that a large plastic deformation is required to produce the object. The lower strain hardening resulting from the lower tin content facilitated the metal forming. Contrary to the lower strain hardening, annealing may also have been required, and the last step in the production technique was softening. This is indicated by the recrystallized grain structure seen on the micrograph (Fig. 10.4: a). Small but elongated copper sulphide inclusions are visible in the microstructure (Fig. 10.4: b, c). The elongation of the inclusions is a consequence of the plastic deformation. Their size is seemingly small, so a more accurate picture of their nature is obtained by SEM examination (Fig. 10.4: c, d). Composition analysis confirms that these are copper sulphide inclusions. From the elongation of the larger inclusions, it is possible to deduce the extent of total plastic deformation. To do this, however, we must consider that the inclusions may be fragmented during metal forming and annealing. Considering the typical inclusion in Figure 10.4: c, it can be seen that the stud was indeed made extensive total cold deformation. Only a thin layer of corrosion covered the object, suggesting a general corrosion process.

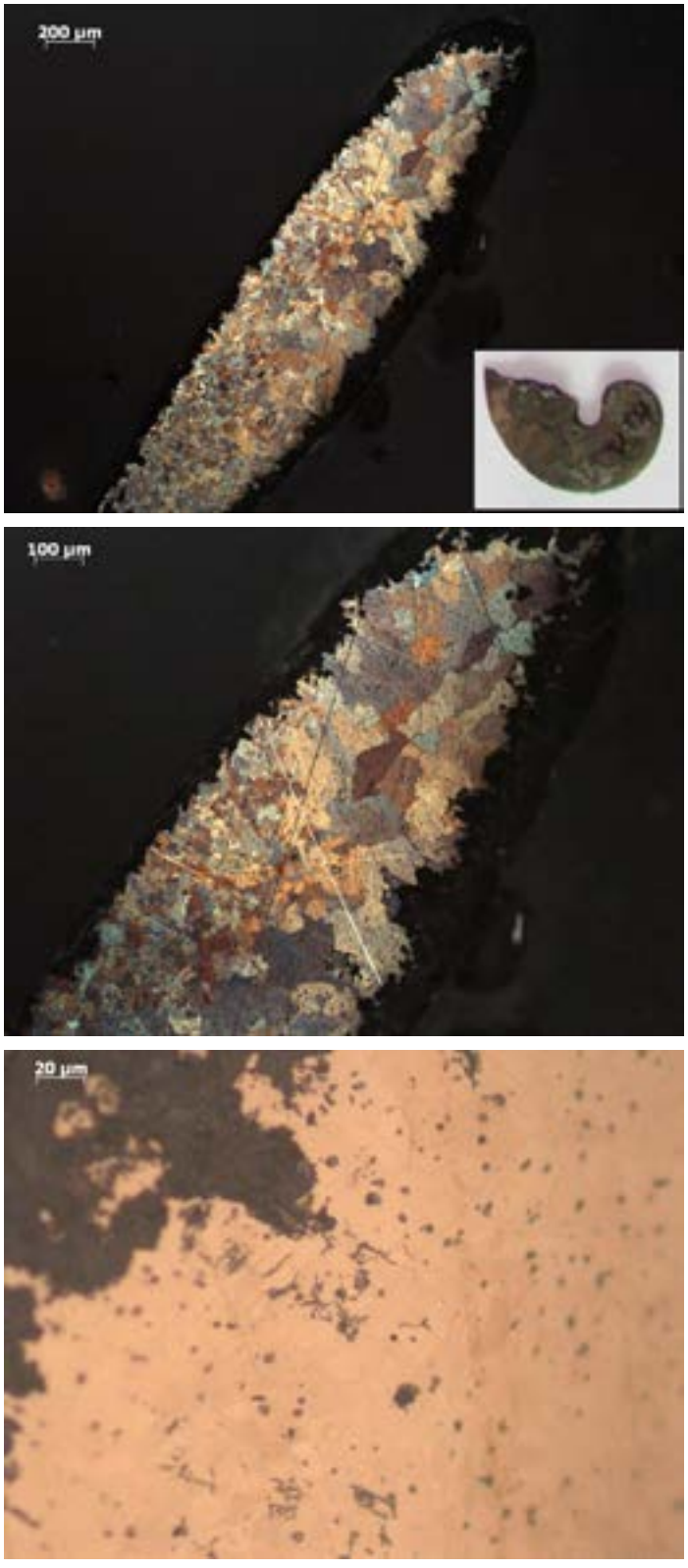


Figure 10.5. Micrographs taken from the Ω-shaped pendant V64. The colour etching reveals the grain structure (a, b). A duplex grain structure can be seen, with a far smaller grain size on one side of the pendant (b). Globular small-sized copper sulphide and lead inclusions can be observed in a bright field image (c). Created by the authors.

Omega-Shaped Pendant V64

The omega-shaped pendant was also made by cold deformation and then annealing after casting. This is proved by the recrystallized microstructure (Fig. 10.5: a). A duplex grain structure can be seen on the micrographs. Quite small grains formed in one side of the sample while larger grains build up the other parts of the examined section (Fig. 10.5: b). In terms of the shape and dimensions of the piece, this duplex grain structure could have formed if one side had been deformed to a greater extent than the other. Its tin content is 5.69 w / w%, which is moderate. It provided high strength to the material of the object. In addition, a small amount of antimony was measurable (0.59 w / w%). The presence of antimony is common in the examined objects, however, detecting only antimony next to the tin occurred only in this one case (Table 10.1). Small inclusions are seen in the microstructure (Fig. 10.5: c). Most of these are small globular copper sulphides, however, lead inclusions of similar size can be observed in addition to sulphides.

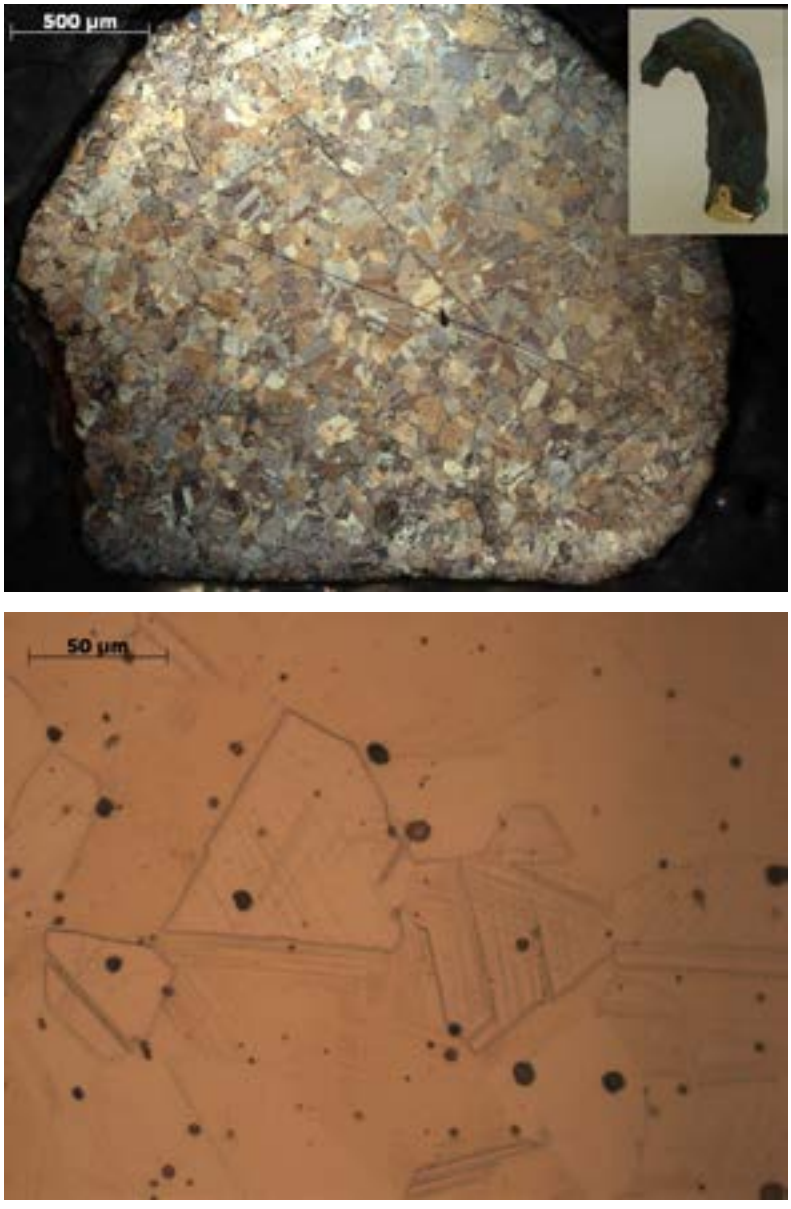


Figure 10.6. The wire arm ring V75 has a recrystallized structure (a). In a bright field micrograph larger and smaller inclusions can be seen (b). The majority of the inclusions are copper sulphide, but a few lead inclusions also exist. Created by the authors.

Arm Ring V75

The arm ring is made from tin bronze without any other additives. The tin content is relatively high ~12w / w% (Table 10.1). This high tin content provided high hardness for the pin. This type of copper-tin alloy has high strength and intensive strain hardening. Therefore, the cold plastic deformation requires significant force, and ductility decreases greatly as the extent of deformation increases. This explains the recrystallized structure. After certain cold deformation, annealing was necessary to continue further deformation. The shape of the objects suggests a large degree of total deformation. Hot forging of this alloy means cracking is possible, so the possible method of deformation was a sequence of cold deformation and annealing heat treatment. The recrystallization process of this alloy is a fast process at a high temperature range (600–800°C) which results in the observed medium-sized grain size (~50µm). The corrosion of the objects resulted in a thin corrosion layer on the surface, so nearly the whole cross-section could be examined. Based on the corrosion layer, a regular general corrosion is observed. Mainly smaller but a few larger inclusions can be seen in the microstructure (Fig. 10.6: b). All inclusions are copper sulphide. The shape of these areas seems globular, but it must be considered that this section shows a cross-section of the inclusions too. A perpendicular section would reveal the real shape.

Spiral Plate Tube (SCS)

The tin content of the spiral tube is ~6.4w / w%, which can be said to be medium. It also contains small amounts of antimony, nickel, and silver (Table 10.1). These components represent a group of alloys with respect to the objects examined. In terms of concentrations, tin content largely determines the properties of an object. The mechanical properties are interesting, which are high strength and hardness. However, this alloy is also excellent for cold forming. The nature of the object presupposes a large plastic deformation, the extent of which must always be considered in comparison

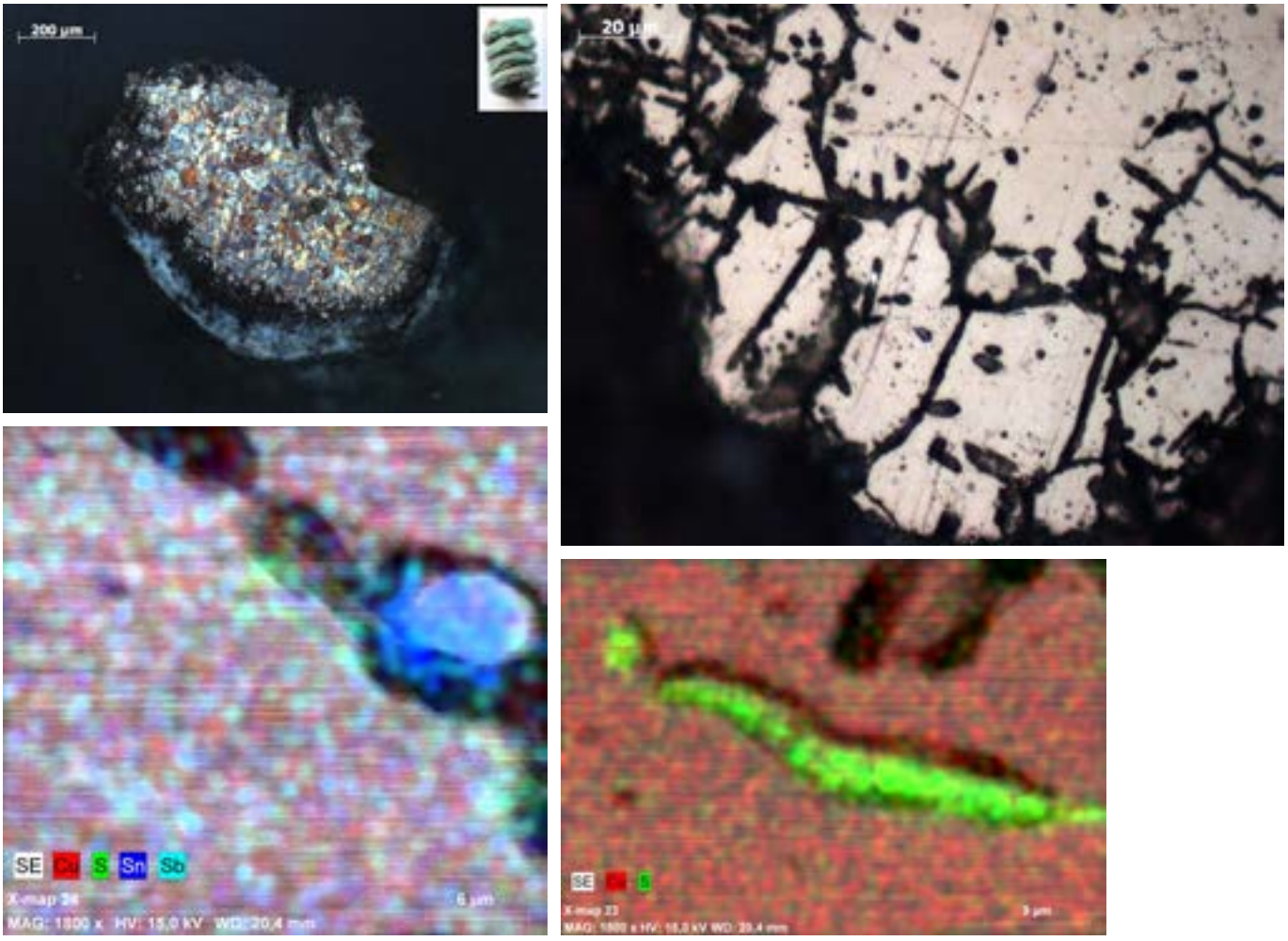


Figure 10.7. The colour etching reveals a recrystallized grain structure of the wire spiral beads. larger and smaller inclusions can be seen in the bright field micrograph (b). The large inclusions are copper sulphide ones, the smaller ones are lead inclusions. The sulphide inclusions have an elongated shape (d). Next to the lead inclusions tin and antimony inclusions appear near the corrosion layer (c). Created by the authors.

with the assumed strain hardening of the alloy. For this reason, it was annealed either during manufacture or at the end of the deformation before finishing (here winding). For this reason, a recrystallized grain structure is seen on the microscopic image (Fig. 10.7: a). The particle size was medium to large, indicating either a slight deformation after pre-annealing, or the object spent a longer time at high temperatures, and the process of grain coarsening increased the grain size. The determination of the real process is complicated due to the extensive corrosion of the object and the thick corrosion layer. Due to this corrosion, only a part of the cross-section can be examined, not the entire original one. Large inclusions can be observed in the microstructure. Large, elongated inclusions are copper sulphides according to SEM analysis (Fig. 10.7: d). The smaller spherical inclusions are for the most part lead inclusions. Lead was not dissolved by copper in the solid phase, so it is found in an almost pure metal form as inclusions. While sulphides are elongated by plastic deformation, lead phases are almost always found to be spherical in shape due to their small size and low melting point. In our case, the bismuth content can be measured in the lead phase and not in the bronze raw material. In addition, between the small inclusions, especially in the area affected to corrosion, an intermetallic phase formed by tin-antimony segregation can be found. These intermetallic phases are also small and spherical (Fig. 10.7: c). In terms of the corrosion process, the tensioned side due to winding is more intense than the compressed side. By its nature, we see a stress corrosion process. Cracks propagated through grains cover a much larger area than in the case of general corrosion. Due to the crack network, corrosion products are encountered over a larger area of the cross-section.

Table 10.1. The average chemical composition of the objects from the Vértesszőlős cemetery. The composition measured by SEM-EDS technique and presented in w / w% units.

object	Al	Si	P	S	Ni	As	Sn	Sb	Pb	Bi	Cu
V2	0.66	1.36	1.03	2.45	0.33	1.22	4.64		0.07		88.25
V29				2.44	0.67	1.64	5.58				89.67
V40				0.19		0.4	3.44				95.96
V64	1.06	0.69		0.53			5.69	0.59	0.69		90.72
V75							11.2				85.59
SCS					1.19	0.31	6.41	0.76	0.15	0.19	89.32

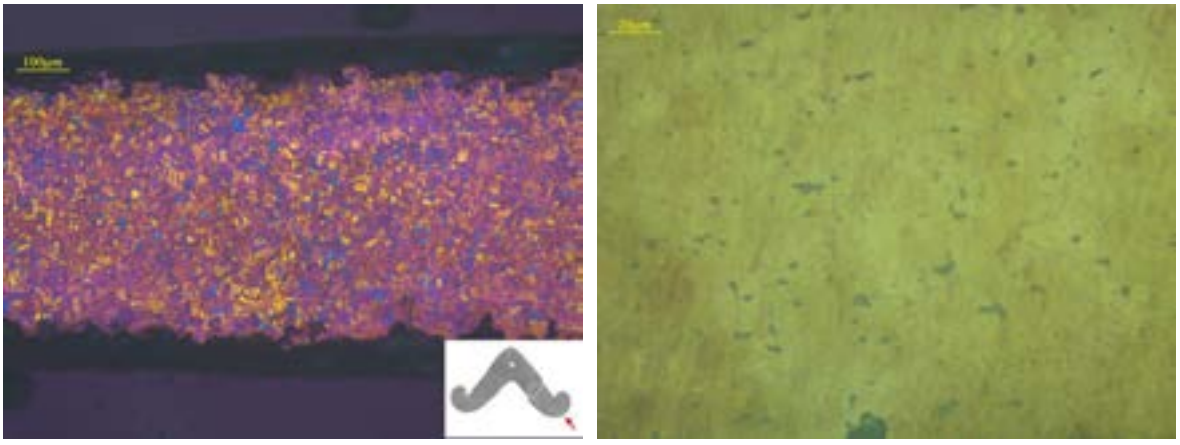


Figure 10.8. The microstructure of the omega-shaped pedant (2010.2.21). The grain structure is recrystallized (a). There are inclusions with a slightly elongated shape in the microstructure (b). Created by the authors.

The Zalaszabar EPC Hoard

Omega-Shaped Pedant (2010.2.21)

The microstructure of the omega-shaped pendant is built up by small, recrystallized grains (Fig. 10.8: a). This means extensive cold deformation or high temperature annealing. Its tin content (~7.2 w / w%) can be considered to be medium. This alloy could be deformed well by cold metal forming. However, the shape of the object assumes annealing used during manufacture. During the annealing the microstructure was recrystallized. Based on the composition, it belongs to the group of alloys containing antimony and arsenic in addition to tin (Table 10.2). The alloy contains silver too, which raises the question of whether this can be considered a new group of alloys. Silver, like lead, has a specific metallurgical behaviour, so in this view, the detected silver content does not designate a new alloy group. The mechanical behaviour of the raw material of the object, as well as its ductility, is determined by the tin content. In the microstructure, small, slightly elongated copper sulphide inclusions can be seen in larger amounts. The object is covered with a medium-thick corrosion layer, the boundary between the corrosion layer and the metallic volume assumes a uniform corrosion process.

Omega-Shaped Pendant (2010.2.27)

The raw material of the pendant belongs to the same alloy group as in the case of the previous object. However, its tin content is higher (~9 w / w%), so it can already be classified as a high tin alloy (Table 10.2). It is more strain-hardened, so a lower degree of deformation could be applied without cracking than the material of the previous object. As a result, annealing is required after a small degree of plastic deformation. For this reason, the microstructure is built up by medium-sized particles instead of small ones (Fig. 10.9: a). Of course, the difference in composition also modifies the kinetics of recrystallization. Tiny, spherical copper sulphide inclusions are seen scattered in the microstructure (Fig. 10.9: b). The number of inclusions is relatively large. In this case, a thick corrosion layer is seen, and uniform corrosion can be assumed too.

Omega-Shaped Pendant (2010.2.39)

The pendant differs from the previous two objects in its composition and manufacturing technique. A dendritic cast structure is seen in the microstructure (Fig. 10.10: a). The dendrites themselves are relatively

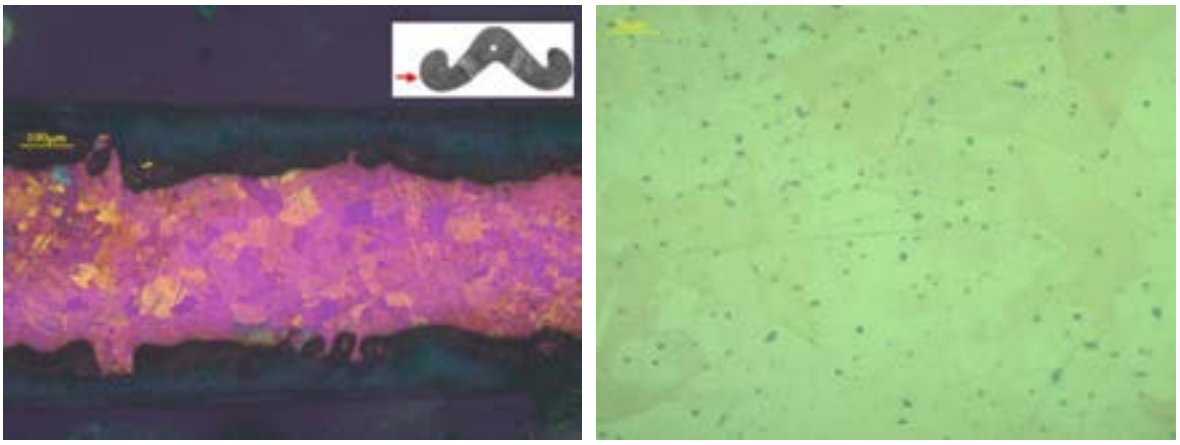


Figure 10.9. The omega-shaped pedant (2010.2.27) has a recrystallized grain structure (a). The microstructure built up by medium-sized grains. There are a lot of globular sulphide inclusions in the microstructure (b). Created by the authors.

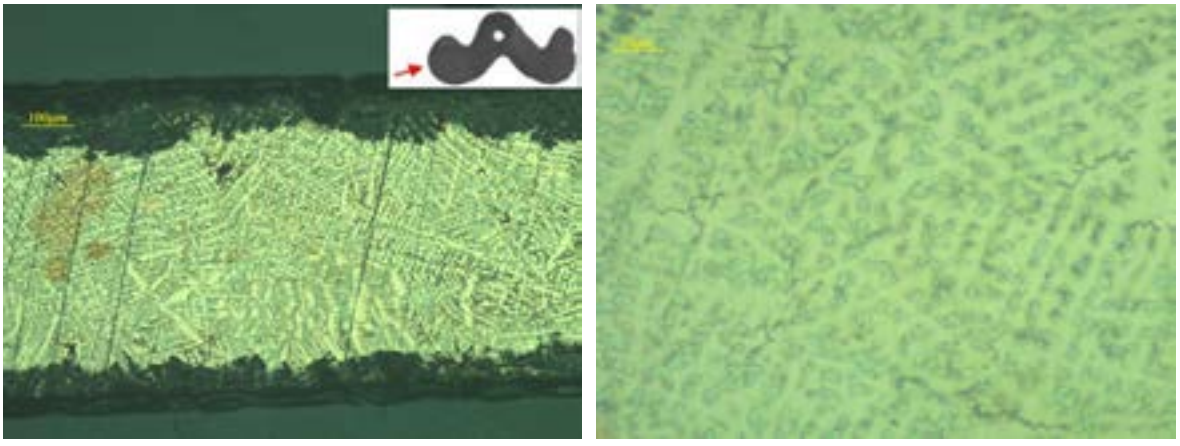


Figure 10.10. Dendritic microstructures show the as-cast state of the omega-shaped pedant (2010.2.39). In higher magnification intermetallic phases can be seen, which form due to the microsegregation process during crystallization (b). Created by the authors.

large, however, the secondary dendrite arm spacing is small. This suggests that the overheating was not large during melting, however, cooling was rapid after casting. Copper-tin intermetallic phases formed because of tin segregation between dendritic arms also support rapid cooling. The geometry of the object caused significant heat transfer over the larger plain surfaces, so the crystallization process was fast. For this reason, a high tin content (11.25 w / w%) was required. The liquidus temperature of this alloy is much lower than the medium tin alloys, so that the mould filling takes place more reliably under certain conditions. The object was subjected to uniform corrosion.

Inverted Heart Pendant (2010.2.48)

No additives other than tin were detected in the material of the pendant. Its tin content is 7.78 w / w%, which is relatively high (Table 10.2). Due to the high tin content, its strain hardening was intense, softening was required before finishing. Accordingly, a recrystallized grain structure is seen on the microscopic image (Fig. 10.11: a). The grain size is relatively small, indicating a high softening temperature. The corrosion of the object was extremely severe, a small part of the cross-section could be examined. Microscopic images indicate uniform corrosion (Fig. 10.11: a). There are many small copper sulphide inclusions in the material that are elongated as a result of the plastic deformation. No other type of inclusion/ enrichment was detected.

Crescent-Shaped Pendant (2010.2.59)

The crescent-shaped pendant was also made by casting. Large dendrites with a small secondary dendrite arm spacing are also seen (Fig. 10.12: a). The full cross-section

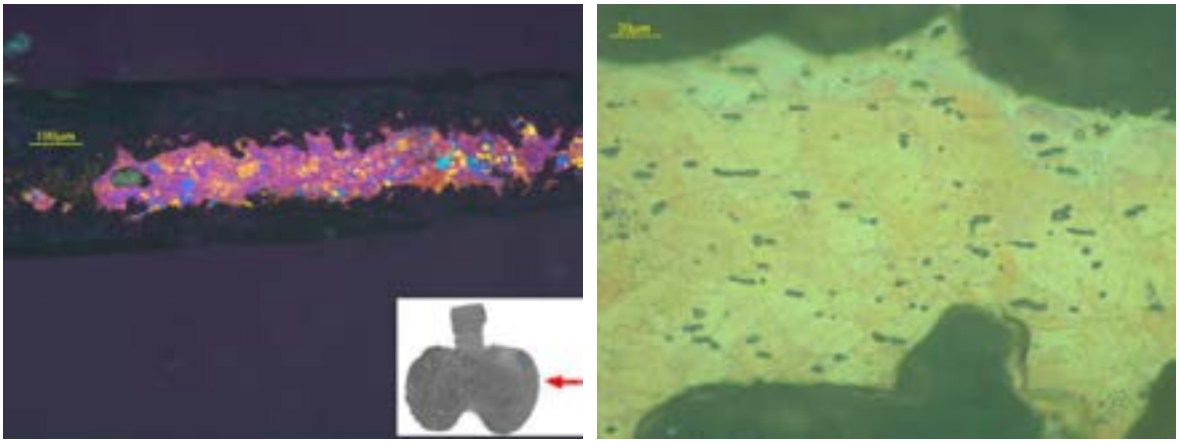


Figure 10.11. Intensive general corrosion process reduced the metallic cross-section of the inverted heart pendant (2010.2.48). Recrystallized grain structure revealed by the colour etching (a). Medium-sized elongated copper sulphide inclusions exist in the microstructure too (b). Created by the authors.

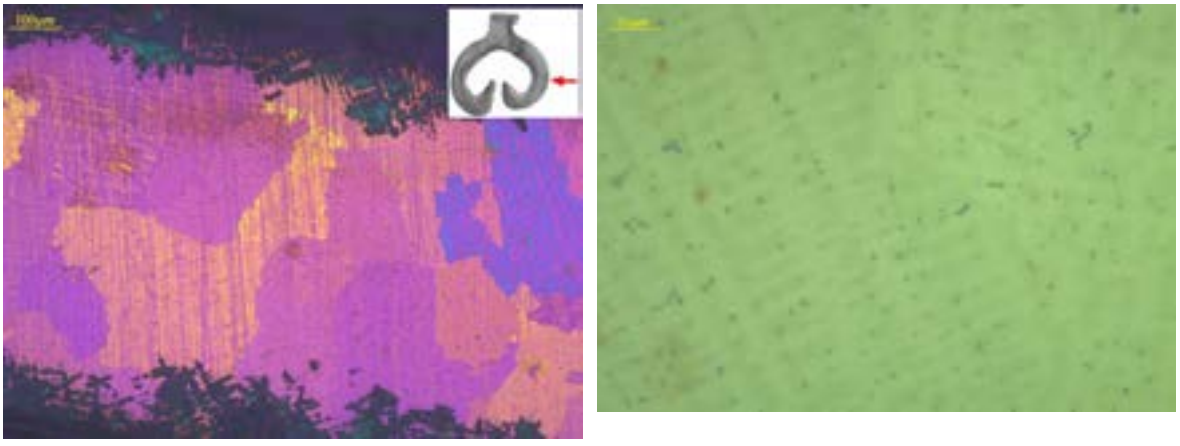


Figure 10.12. The crescent-shaped pendant (2010.2.59) has a crystallized microstructure. Large dendritic grains built up the microstructure (a). The small secondary dendrite arm spacing (b) suggests a high cooling rate.

of the sample here could not be examined, so the crystallization process could not be fully analysed. However, the rapid cooling caused by the size and shape of the object is shown by the dendrite arm spacing and the microsegregation (Fig. 10.12: b). In addition to the phases that crystallize due to segregation, a few small copper sulphide inclusions are also found. The object's tin content is relatively high (8.75 w / w%), but it is not as favourable for casting as alloys with a higher tin content. In terms of composition, it belongs to the group of alloys containing antimony. Silver can also be detected in the alloy (Table 10.2). In all aspects, the tin content determines the properties of the alloy. At the boundary between the corrosion layer and the metal, short strips of corrosion product penetrating the metal can be seen. These are the product of a faster corrosion process due to segregation, which results from the nature of the cast microstructure and rapid cooling. In this case, uniform corrosion must be assumed too.

Spectacle Spiral Pendant (2010.2.61)

Due to the nature of the object, the spiral of the spectacle spiral pendant is made by plastic deformation after casting a precursor. The tin content of the alloy is high (10.3 w / w%), which results in high hardness and strong strain hardening. For this reason, it was necessary to apply annealing during manufacturing, and especially prior to finishing so that it could be wound. For this reason, a recrystallized grain structure can be seen in the microscopic image (Fig. 10.13: a). The grain structure consists of small- to medium-sized grains. The grain size can be considered homogeneous along the cross-section. In addition to tin, antimony can be detected in the alloy, so it belongs to the antimony-containing group. Scattered small inclusions are found in the microstructure (Fig. 10.13: b). From the point of view of their shape, it is also necessary to pay attention here to the inclusions in the cross-section, perpendicular to the direction of

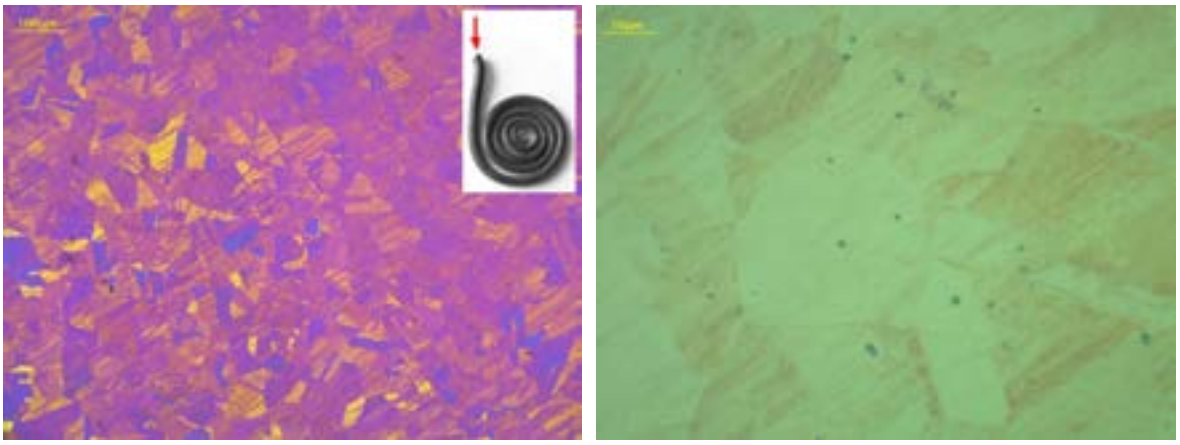


Figure 10.13. The wires needed to be annealed before winding to make the spectacle spiral pendant (2010.2.61). Accordingly, the optical micrograph shows a recrystallized grain structure (a). Small copper sulphide and lead inclusions can be seen in the microstructure (b). Created by the authors.

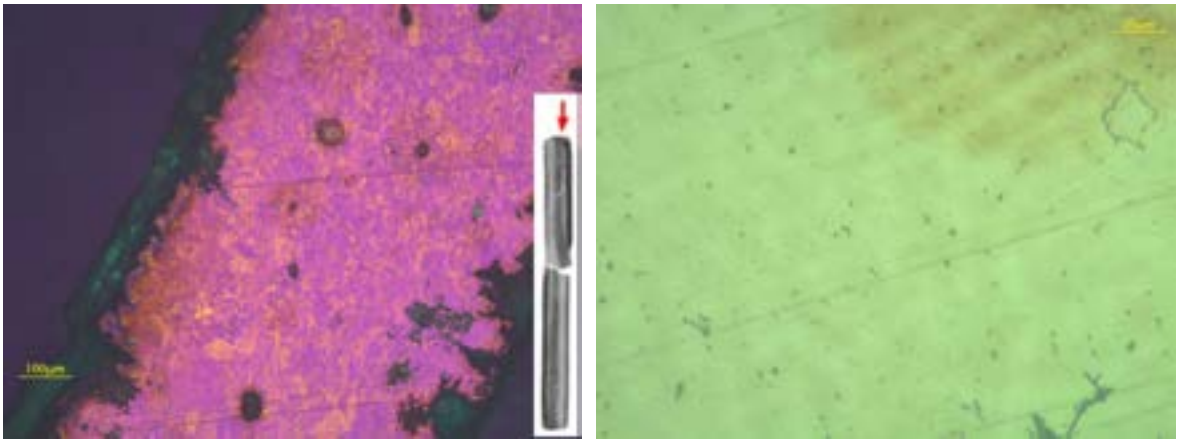


Figure 10.14. The colour etching of spiral plate bead (2010.2.71) revealed a recrystallized grain structure. In the bright field image (b) the microsegregation outlines the dendritic structure of the cast precursor. Additionally, small inclusions can also be seen in the microstructure. Created by the authors.

deformation. Lead and copper sulphide inclusions are found in approximately equal proportions.

Spiral Plate Bead (2010.2.71)

To make a spiral plate bead, a piece of plate is required in the first step, which can be made by hammering a cast precursor. The tin content of the alloy is relatively high at 7.76 w / w% (Table 10.2). Therefore, the hardness of the alloy is also high, but the sheet can be made by cold plastic deformation. Its strain hardening is intense, so annealing was required between forming steps, including the final winding. Therefore, a recrystallized grain structure can be seen on the microscopic image (Fig. 10.14: a). The annealed sheet is much easier to wind up than the hard, untreated one. Due to the winding, there is a difference in the stress state between the drawn and the compressed side. For this reason, signs of stress corrosion can be discovered when examining the microstructure of the object. Although the effect of uniform corrosion is stronger. On a bright field (Fig. 10.14: b), etching reveals a microsegregation pattern of the dendritic structure. This provides two pieces of information: the cooling of the cast precursor was rapid based on the small secondary dendrite arm spacing, and due to the rapid cooling, the segregation became so strong that etching could show it. The dendritic structure was not strongly deformed, i.e., the precursor was not forged to a great extent to achieve the final plate thickness. The small grain size is the result of annealing at high temperatures. Scattered in the microstructure are small-sized, slightly elongated copper sulphide inclusions (which also corresponds to the small degree of deformation). In terms of average composition, the object raw material belongs to the antimony-containing group, and silver content can also be detected in the alloy.

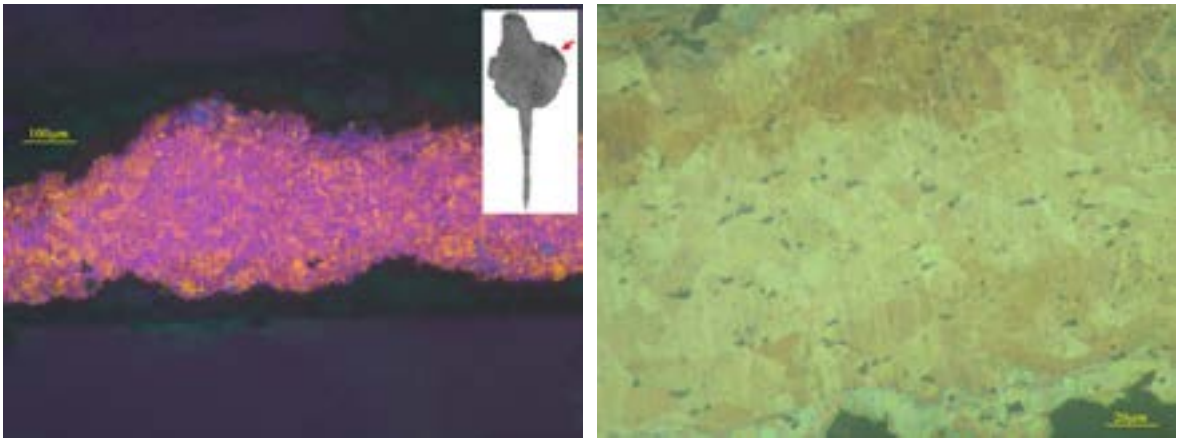


Figure 10.15. The bronze pin (2010.2.78) has a recrystallized grain structure which can clearly be seen in the colour etched structure (a) and in the bright field (b) image. Small, elongated inclusions can also be seen in the bright field image. Created by the authors.

Table 10.2. Average chemical composition of the objects examined from the Zalaszabar hoard. The concentration values in the table are in w / w% unit.

object	Al	As	Ag	Sn	Sb	Fe	Ni	Cu
2010.2.21		1.15	0.7	7.18	0.92			90.06
2010.2.27		1.02	0.69	9.06	0.62	0.35		88.26
2010.2.39	0.33			11.25		0.37		88.06
2010.2.48				7.78				92.22
2010.2.58			0.66	8.75	0.47			90.12
2010.2.61				10.33	0.13		0.4	89.14
2010.2.71			0.83	7.76	1.13	0.19		90.09
2010.2.78			0.23	4.01		0.96	0.93	93.87

Bronze Pin (2010.2.78)

The bronze pin has the lowest tin content (~4 w / w%) which can be considered a medium tin content. In addition, significant amounts of iron and nickel can be measured in the raw material, with a small amount of silver (Table 10.2). This composition represents another group of alloys, especially typical of the Bonyhád hoard. In this test series, only the pin has this as the raw material. The mechanical properties in this case are mostly determined by the tin content. The alloy can be cold deformed well. This property is advantageous in terms of the shape of the object. Also in this case, the last step of the manufacturing was an annealing heat treatment, as shown by the recrystallized grain structure (Fig. 10.15: a). The microstructure is made up of small grains. The flattened part was examined, so the large extent of deformation can be identified on the basis of the small grain size. The microstructure contains a large amount of small copper sulphide inclusions elongated according to the metal forming. In addition to sulphides, small amounts of globular lead inclusions are also found in the alloy. The object is affected by a high degree of uniform corrosion.

The Bonyhád Biogáz Factory EPC Cemetery

Spiral Wire Beads

The chemical composition of a sample group of spiral beads made of copper is shown in Table 10.3. Five samples of the mentioned object type were examined. These ornaments cover the entire period of the Bronze Age. BQ200, one of the examined objects, was a spiral wire bead from the earliest inhumation burials dated to the Early Bronze Age (Bonyhád — phase 1, twenty-second–twenty-first centuries BC). This ornament was worn around the neck. Two samples of the spiral beads found in the cremation burial BQ84 were examined. These objects can be assigned to the second phase of the Bonyhád cemetery, dated by ^{14}C to 1940–1820 BC. The bead was excavated from the scattered cremation grave marked BQ31 from the end of the Early Bronze Age or the beginning of the Middle

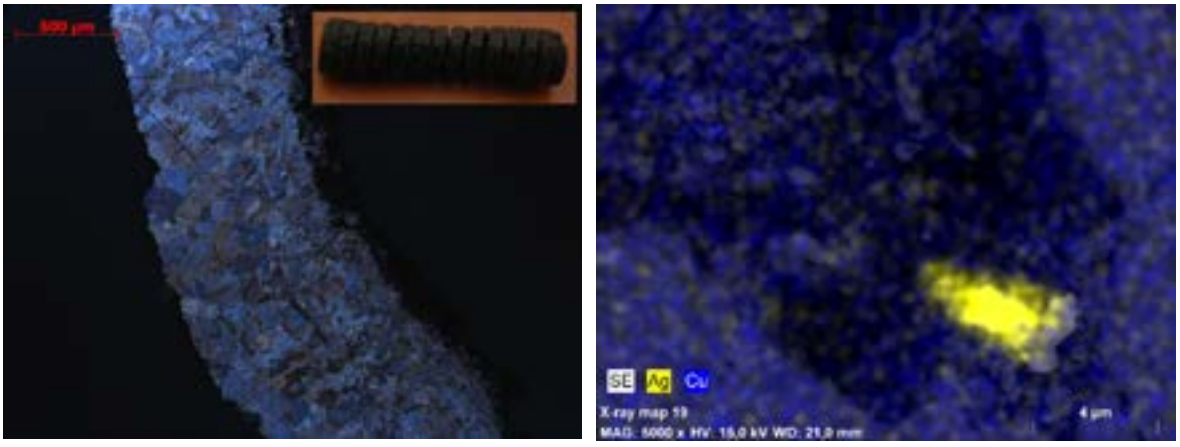


Figure 10.16. Optical microscopic images of spiral wire bead BQ200 (J4) (a). SEM-EDS element map shows the silver segregation in the corrosion layer. Created by the authors.

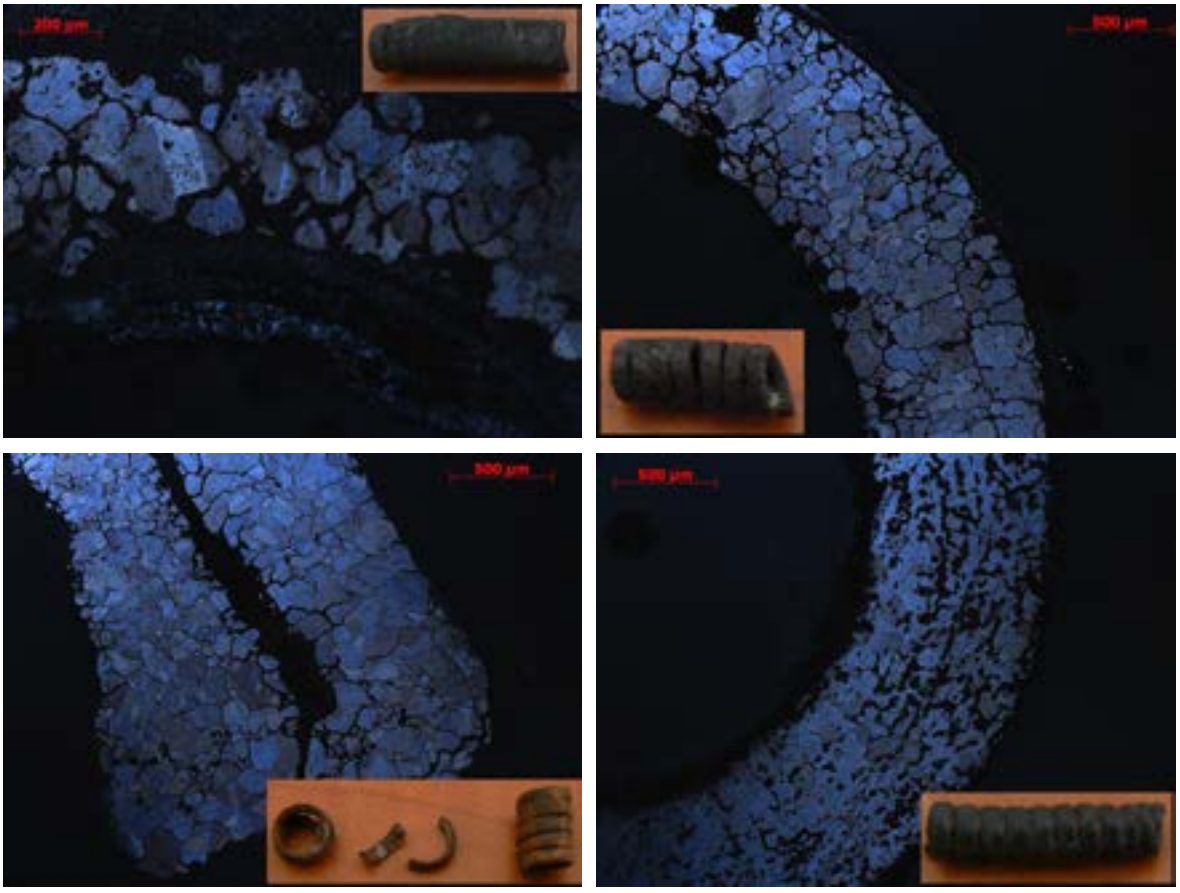


Figure 10.17. Micrographs taken from spiral wire beads BQ84 (J5) (a), BQ84 (J6) (b), BQ31 (J3) (c), and BQ151 (J12) (d). Created by the authors.

Bronze Age. It can be classified into Bonyhád phase 2–3 (*c.* twenty-first–nineteenth centuries BC). The spiral bead found in the BQ151 scattered ash burial can be dated to the third phase of the Bonyhád cemetery (beginning of the Middle Bronze Age, *c.* twentieth/nineteenth century BC). Spiral beads made of this copper can be further divided into two groups based on their composition: there are samples where As and Ag appear together in the composition, while Ag was not detected during the average composition analysis in some samples (Table 10.3). However, silver was detected in the corrosion product in all cases (Fig. 10.16:

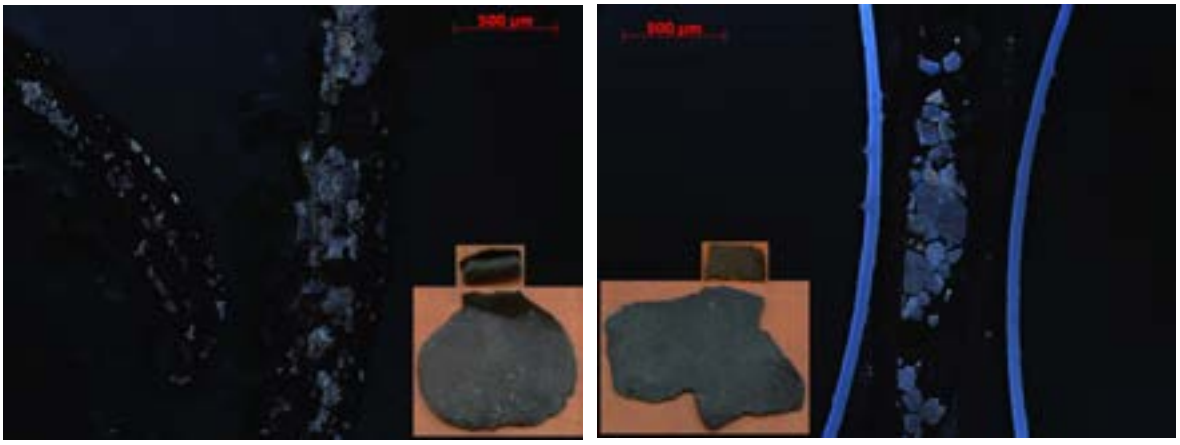


Figure 10.18. Optical microscopic images taken from object BQ114 (J4) (a) and BQ114 (J17) (b). The pendants are affected by strong corrosion. Just a few grains can be seen in the metallic part of the section. Created by the authors.

b). This raises the question of whether objects where silver was not detected represents another group of alloys, or their silver content is less than the detection limit of the SEM-EDS test. Further analysing the composition, it can be seen that the BQ200 (J4) and BQ84 (J5) beads belong to the antimony-containing alloy group, while the other beads are made of the arsenic alloy group. It is interesting to note that each metal contains little tin. Since they are copper, the raw materials can be well characterized on the basis of the analysis of spiral beads, and it is clear that antimony, arsenic, silver, and lead are impurities in the copper raw material and not in the tin during the alloying of bronze. This supports the fact that the alloys can be classified based on these aspects.

Equiaxial grain structure observed on the optical micrograph (Fig. 10.16: a) of the sample BQ200 (J4) suggests that the object was deformed into the desired shape by hammering and then wound into its final shape after subsequent heat treatment. Silver was also detected in the corrosion product in each case (Fig. 10.16: b). This is because during the corrosion process, the corrosion first reacts with the less noble metal, in this case copper, while the more noble metal, the silver, enriches and segregates near the surface.

On the grain structure of the sample labelled BQ84, it can be observed that the object was exposed to high heat, presumably burned. Due to the high heat, the grain boundary corrosion accelerated to such an extent that the material almost disintegrated into grains along the grain boundaries. In this case, the manufacturing technique cannot be identified. In the remaining metallic parts the effects of fire have removed all traces of microstructures from the preliminary operations.

Sample BQ31 (J3) may also show signs of burning. In this case, the grain structure along the grain boundaries fell apart into grains too. The effects of metalworking cannot be identified here either. Regarding the composition, silver was not detected in the metallic part of this sample. Microscopic images of sample BQ151 (J12) show effects of stress corrosion. The reason for the appearance of stress corrosion is that compressive and tensile stresses arose on opposite sides of the sample during the last deformation, which was the spiral winding (Fig. 10.17: d). The corrosion processes are accelerated by this mechanical stress difference. The equiaxial structure of the sample suggests that the object was annealed by post-deformation heat treatment, thus facilitating the winding to the final shape shown in the image of the sample. The highest Ag content in the metal was measured for this sample.

Objects Made from Bronze: Inverted Heart-Shaped Pendant and Wire Arm Rings

The inverted heart-shaped pendants were made of a medium-tin bronze raw material (Table 10.3). Their grain structure also shows that they have been burned. Therefore, the traces of manufacturing of the metal can no longer be identified from the equiaxial structure of the remaining metallic grains. However, in terms of the shape and composition of the pendants, the Sn content suggests improved casting properties compared to copper. Here the tin alloying also increased the hardness, thus reaching the final shape and dimensions of the object necessitating casting a precursor, plastic deformation, and heat treatment (Fig. 10.18). This assumption is supported by the results of the tests of the inverted heart-shaped pendant found in Zalaszabar, which is exactly the same as the Bonyhád artefact. In contrast to the Bonyhád pendant, the Zalaszabar pendant was not burned, so its structure is suitable for metallographic analysis. In this case, the small, recrystallized particles suggest that the casting and subsequent metal forming

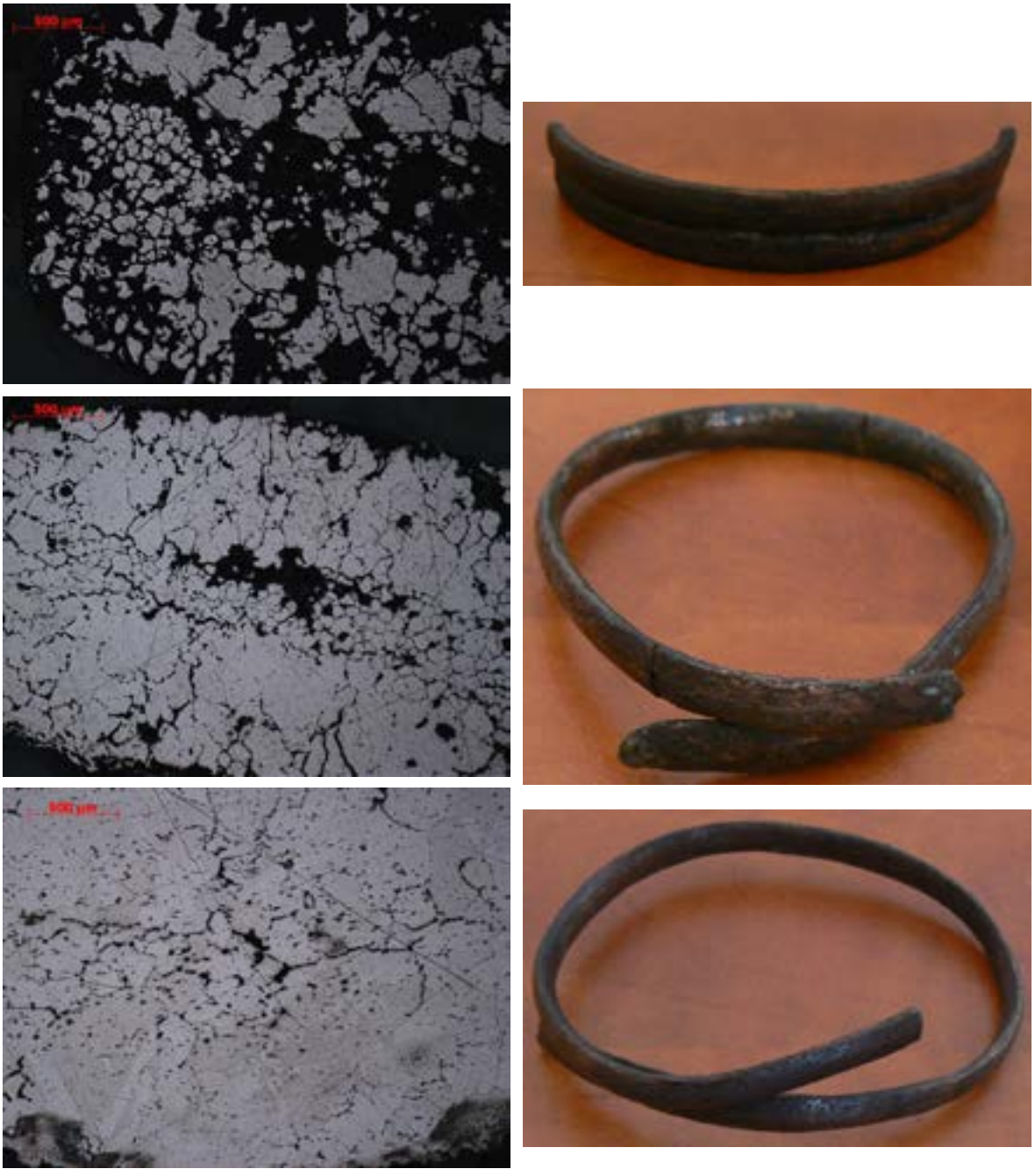


Figure 10.19. Photos and bright field optical microscopic images of wire arm ring BQ231 (J1) (a), BQ231 (J2) (b) and BQ231 (J3) (c). Strong corrosion effects can be observed in the micrographs. Created by the authors.

were followed by an annealing as a stress-relieving heat treatment (Fig. 10.11). This was necessary to prepare the folded ear. In terms of average composition, plate pendants belong to the group of alloys containing antimony, arsenic, and nickel.

Microscope images of a sample taken from the wire arm ring Q231 at three locations (J1, J2, J3) can be seen at 50× optical magnification in a bright field illumination (Fig. 10.19). This object did not suffer from burning, but the accelerated corrosion due to core segregation left a significant trace on micrographs.

During the manufacturing of the wire arm ring, the following processes took place: a thin rod was cast as a first step, during which the hot metal in contact with the cold mould crystallized quickly.

So, the following crystallization process took place across the whole cross-section from the surface at the mould to the middle. Due to the specific volume

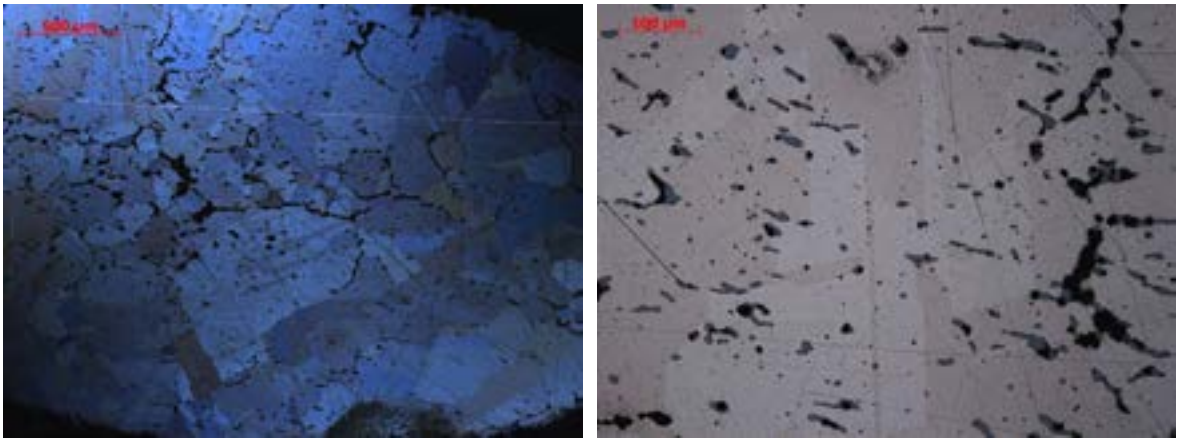


Figure 10.20. Optical micrographs of BQ231 (J3) wire arm ring. Image was taken in polarized illumination after etching by K2CrO4 (a) and in bright field illumination after FeCl3 etching. Created by the authors.

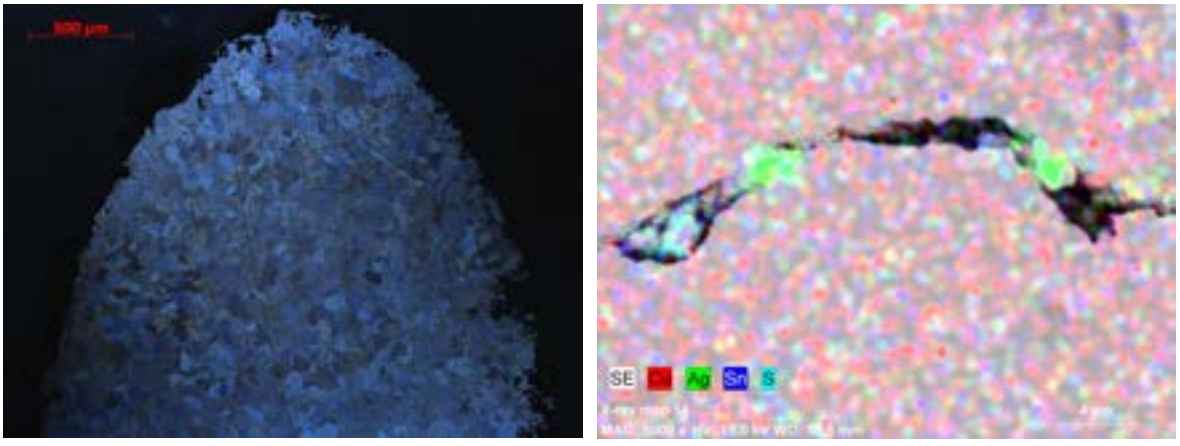


Figure 10.21. Optical micrographs of arm ring BQ209 in polarized light, 50× magnification (a). SEM micrograph, 5000× magnification (b). Created by the authors.

difference between the solid and liquid metal, a central cavity formed. Due to the cavity and core segregation, the corrosion process was more intense, which caused the damage shown in the micrographs. If we look at the microstructure under polarized illumination (Fig. 10.20: a), the sample was annealed after plastic deformation. This annealing allowed the wire arm ring to be wound to its final shape, as the nearly 3 per cent Sb content required it. Antimony hardened copper more intensely than tin, i.e., a lower concentration is sufficient for the same hardness. However, antimony also makes the alloy more brittle than adding tin.

The microstructure of the other wire arm ring tested (BQ209) shows an annealed grain structure (Fig. 10.21: a). It can also be seen that the arm ring was heat-treated after casting and plastic deformation, and this exceptionally high tin content also proved that the winding operation can be feasible. The raw material of the arm ring belongs to the same alloy group as that of the previous object. Here silver is also detected, which is also enriched in the corrosion layer (Fig. 10.21: b).

Evaluation

In the evaluation of the metallographic examinations, the study focused on two aspects. On the one hand it examined the average compositions of the metal; the results of the SEM-EDS analysis were used in an attempt to identify groups of characteristic compositions. Naturally, comparisons were made in the case of both the hoards and the individual objects. On the other hand, the composition of each object was compared with the microstructural characteristics. Based on the microstructure study, the manufacturing techniques were hypothesized. Comparing this to the composition, a more accurate picture could be obtained of how the objects are made. The given object types were also compared from this point of view. This analysis is

Table 10.3. The average composition of the examined objects from the Bonyhád cemetery. The concentration is in w / w% units.

Object	Inventory no.	Cu	O	As	S	Pb	Bi	Ag	Sn	Sb	Ni	Other
spiral wire bead	BQ200 (J4)	97.53		0.37	0.25	0.17		0.35	**0.74**	0.4		Si: 0.19
	BQ84 (J5)	97.52		0.74	0.36			0.36	**0.62**	0.4		
	BQ84 (J6)	97.98		0.73	0.22	0.31			**0.4**			
	BQ31 (J3)	96.94		0.97		0.64			**0.42**			Zn: 0.73
Inverted heart-shaped pendant	BQ114 (J4)	89.04		0.47	0.8	0.23	0.41	0.87	**6.76**	0.54	0.56	Co: 0.29
	BQ114 (J17)	88.48	0.49	1.00	0.35	0.29	0.73	1.68	**4.91**	1.19	0.54	Fe: 0.35
Wire arm rind	BQ231 (J1)	87.05	2.67	1.05	1.33	0.48	0.33	2.2	0.52	**2.99**	1.24	Fe: 0.15
	BQ231 (J2)	91.35		0.99		1.25		1.9	0.44	**2.12**	1.96	
	BQ231 (J3)	96.26		0.87				0.44		**0.74**		Si: 0.07
	BQ209	84.41		0.64	0.07	0.51		1.52	**11.3**	0.39	0.74	

complicated by the fact that the nature of the shape of specific objects determines the manufacturing technique, which is why the manufacturing of each type of object is independent of the same hoard and composition.

One typical chemical composition contains tin, antimony (0.3–0.7w / w%), silver (0.3–0.7w / w%), and arsenic (0.4–1w / w%). The raw material itself can be seen in the examination of the spiral beads of the Bonyhád hoard, combined with tin it can be seen as the material of the plate pendants, but it also appears among the raw materials of the Zalaszabar hoard objects.

The amount and presence of silver is always an interesting question, since in an alloy in which silver was not detected, segregation can be detected in the corrosion product. In this case, the question arises as to whether the alloy containing tin, antimony, and arsenic forms a separate group or not. However, the alloy of tin, antimony, and silver found in the hoard of Zalaszabar is different from the previous ones.

The presence of nickel (as well as iron) is an indicator that is examined in literature. In this point of view, a uniform picture is not seen either, nickel was found with arsenic, and arsenic with antimony in the Vérteszszőlős artefacts, and with iron and silver in the hoard of Zalaszabar. In the Bonyhád objects, arsenic, silver, and antimony were detected in addition to nickel.

In the Vértesszőlős and Zalaszabar artefacts an object was found in which no element other than tin was detected. However, there was no object of this composition in the group examined from the Bonyhád hoard. Consequently, in terms of representative composition, objects can be paired up with one another, however there is no common composition in all three cases. Regarding tin quantity, the Vértesszőlős objects were characterized by a low tin content, while the Zalaszabar objects were characterized by a medium tin content. In the case of the bronzes examined in Bonyhád objects, we encounter both cases, although neither of them can be considered characteristic in terms of the number of objects. Additional studies are needed to establish this.

The tin content must also be compared with the manufacturing technique, as tin has a great influence on the mechanical properties, and thus on the ductility. The general manufacturing technique in each object is cold plastic deformation and heat treatment. During manufacturing, a cast precursor is to be assumed, which is then deformed by hammering for example. During the plastic deformation, the bronze hardens, so after a certain degree of forming it is necessary to anneal it, which can be done by heat treatment. Interestingly, each hammered object in the hoard was eventually softened. This was presumably necessary to facilitate finishing.

The typical manufacturing technique for tin bronzes is cold plastic deformation. However, the higher the tin content, both the greater its strength and the more intense its strain hardening. The ductility limit is ~12 per cent tin content. Even objects with such a high tin content were deformed. Only three cast objects were found in the studied population.

Both crescent-shaped pendants were made by casting. The pendant from Zalaszabar was made with a high (8.75 w / w%) tin content, while the one from Vérszszőlős had a lower (5.58 w / w%) one. Taking the other components into account, the same casting temperature means a higher superheat for the raw material of the Zalaszabar pendant, which is more favourable from a casting point of view.

The comparison of spiral beads and wire arm rings cannot be considered relevant from a manufacturing point of view. Due to the nature of the objects only the cold forming and annealing technique can be considered. Regarding the shape and geometry of the objects, the same conclusion can be reached in the case of the plate pendants as well. However, the omega-shaped pendant from Zalaszabar was cast, while the other plate pendants are plastically deformed and annealed in each hoard. The pendant from Zalaszabar itself is thin and would have cooled quickly due to its large surface area, so proper mould filling is only safe with a high tin content. Indeed, this pendant has the highest tin content.

It should be noted that the Zalaszabar and Bonyhád plate pendants which belong to the same alloy group are made by plastic deformation. The Zalaszabar pendants have a higher tin content. Both the cast and the Vértesszőlős pendants fall into different alloy groups. For the other artefact groups, such an observation cannot be made on the basis of the test results.

The choice of material for the application is the most obvious in the samples examined in Bonyhád, as more malleable copper was used than hard bronzes for objects requiring extensive deformation. The hoard of Zalaszabar consists of objects with a higher tin content, whether the need for deformation was high or low. However, the cast objects were made of a high alloy content, which results in an easier casting, while the Vértesőlős cast object has a medium alloy content, which is more difficult to cast in the same circumstances. Metallographic studies are able to show the properties of hoard objects even when the deposit consists of a wide variety of finds. Alloy groups could be identified, but a composition specific to a given hoard could not be found. There was no alloy group that appeared in all three hoards. There is a correlation between object types in the manufacturing technique, but it must be considered that most objects were made by cold plastic deformation and annealing, and there are also objects which, due to their nature could only have been made practically with this technique. Thus, this comparison only allows the examination of the choice of material composition — estimated properties — manufacturing technique. Here, mainly cast objects and their comparison with formed and heat-treated ones provide results. The choice of materials for the objects implies the technique of the period and the supply of raw materials.

From the plate pendants we found a correlation in the case of the omega-shaped one, where the pendants from Zalaszabar and Bonyhád that were made by metal forming and heat treatment, belong to the same alloy group. In the hoard of Zalaszabar we find a cast pendant that belongs to another group of alloys in addition to its high tin content. The spectacle spiral pendant also belongs to another group of alloys. These observations suggest that the organization of the supply of raw materials was low and that an alloy was obtained as the raw material, from which the objects were then made with the intended manufacturing techniques. It also seems that in a metallurgical sense the metalworkers had a wider range of possibilities in raw materials than in manufacturing techniques. This constraint is reflected in the usage of the object, as well as their fate after use, based on the gathered data from the composition, manufacturing processes, and life cycle of the analysed objects.

The examination of the hoards and the bronze objects from the burials reveals that there is only partial overlap in the ornament types, for example both the Zalaszabar hoard (2010.2.48) and the cremation grave (BBQJ4, BBQJ17) of the Bonyhád cemetery BQ114 contained an inverted heart-shaped pendant. The difference in the end of the life cycle of these objects is evident however, as the hoard object is heat treated for manufacturing reasons but does not show signs of burning, while the find from the grave is significantly burned. This is obviously a result of the rite, where the deceased was cremated together with their ornaments. The microstructure of the omega-shaped pendants from the two examined hoards (2010.2.21, 2010.2.27, 2010.2.39, V64) as well as the disc-headed pins show that these objects were not burned, so the possibility of retrieving the artefacts after cremation and burying at a separate location is excluded. Shifting attention to the differences instead of the similarities, an evident distinction is the complete lack of omega-shaped pendants, characteristic of the EPC hoards, from the graves of Bonyhád as well as most cemeteries of the period.

This suggests that a certain group of objects was handled separately and was not considered a part of the grave goods and were simply buried in the ground at the end of their life. From this aspect, it was important to clarify that the omega-shaped ornaments represented fertility and abundance, while examples from Mesopotamia show that these may even represent the goddess herself. Similar representative symbols can be found on the well-known Cybele/Artemis sculptures, where bull testicles attached to a belt can be found over the garment. Possibly, the role and message of the omega-shaped pendant is analogous for the EPC, which is also notable in how these were worn: sewn onto the clothing, or as an ornament on its own, part of the festive and ritual wear. This also points to the symbol fulfilling a continuous demand, as it was not related to the individual, instead connected to a role, function, or community. This may provide an explanation as to why garments decorated with omega-shaped pendants and similar symbols were not cremated together with the woman who fulfilled a leading role. Instead they were returned to Mother Earth as a sign of sacrifice, while the generally worn ornaments and accessories (inverted heart-shaped pendants, spiral arm beads) are present in the graves. Despite the extended area and longevity of the EPC there are only a few hoards within the Carpathian Basin that are similar to the ones from Zalaszabar and Vértesszőlős, and these are mostly dated to the late Middle Bronze Age. This may point to a practice in specific communities where clothing passed down between individuals with the same function, kept in use for rituals, and only finally buried at a later point in time. Only further research can clarify whether the creation of these uniquely composited hoards is based on religion, or if something practical related to the historical changes in the late Middle Bronze Age played a bigger role.

Works Cited

Black, Jeremy, and Anthony Green. 1992. *Gods, Demons and Symbols of Ancient Mesopotamia* (London: London British Museum Press)

Bóna, István. 1958. 'A bronzkor Magyarországon' (unpublished doctoral thesis, Eötvös Loránd University)

Csalog, József. 1942. 'Bronzkori temető és újabb kőkori lakótelepnyomok Bonyhád határában', *Archaeologiai Értesítő*, 3.3: 119–43

Hajdu, Tamás, Alexandra György-Toronyi, Ildikó Pap, Wilfried Rosendahl, and Géza Szabó. 2016. 'The Chronology and Meaning of the Transdanubian Encrusted Pottery Decoration', *Prähistorische Zeitschrift*, 91.2: 353–68

Honti, Szilvia, and Viktória Kiss. 2013. 'Bronze Hoard from Zalaszabar. New Data on the Study of the Tolnanémedi Horizon – Part 2', in *Moments in Time: Papers Presented to Pál Raczky on his 60th Birthday*, ed. by Alexandra Anders, Gabriella Kulcsár, Gábor Kalla, Viktória Kiss, and Gábor V. Szabó, Prehistoric Studies, 1 (Budapest: L'Harmattan), pp. 521–38

Junghans, Siegfried, Edward Sangmeister, and Manfred Schröder. 1968. *Kupfer und Bronze in der frühen Metallzeit Europas*, Studien zu den Anfangen der Metallurgie, 2.2 (Berlin: Mann)

Kiss, Viktória. 2009. 'A bronzkori kerámia-készlet változásairól (A mészbetétes kerámia kultúrája tipológiai vázlata)', *Tisicum*, 19: 155–73

——. 2012. *Middle Bronze Age Encrusted Pottery in Western Hungary*, Varia archaeologica Hungarica, 27 (Budapest: Archaeolingua)

Kiss, Viktória, Péter Barkóczy, and Zsuzsanna Vízer. 2013. 'A zalaszabari bronzkincs archeometallurgiai vizsgálatának előzetes eredményei', *Gesta*, 13: 72–82

Mozsolics, Amália. 1967. *Bronzefude des Karpatenbeckens: Depotfundhorizontes von Hajdúsámson und Kosziderpadlás* (Budapest: Akadémiai Kiadó)

Szabó, Géza. 2009. 'Csalog József bonyhádi mészbetétes temetője az újabb kutatási eredmények és két egyedülálló lelet tükrében – The Cemetery of the Encrusted Pottery Culture at Bonyhád in the Light of New Research and Two Iniwue Finds', in *Medinától Etéig: tisztelgő írások Csalog József születésének 100. évfordulóján*, ed. by L. Bende and Gábor Lőrinczy (Szeged: Móra Ferenc Múzeum), pp. 283–91

——. 2017. 'Problems with the Periodization of the Early Bronze Age in the Carpathian Basin in Light of the Older and Recent MMS Radiocarbon Data', *Archeometriai Műhely*, 14.2: 99–116

Szabó, Géza, Péter Barkóczy, Laura Juhász, and Szilvia Gyöngyösi. Forthcoming. *Keleti tárgyak összehasonlító archeometallurgiai elemzése a regölyi halom és környékének bronzleletei alapján*

Szabó, Géza, and Tamás Hajdu. 2011. 'A mészbetétes edények díszítésének szimbolikája a bonyhádi vegyes rítusú bronzkori temető embertani leleleteinek feldolgozása tükrében (Symbolism of the Ornaments of Encrusted Pottery in the Light of Anthropological Finds from the Bronze Age Mixed-Rite Cemetery at Bonyhád)', *Anthropologiai Közlemények*, 52: 85–108

11. Re-theorizing Deposition in Bronze Age Europe

▾ **ABSTRACT** Bronze Age societies were historically unique by carrying on old ritual traditions of storing and depositing valuables when a new metal economy took hold that transformed regional Neolithic and Chalcolithic societies into hierarchical, commercial societies. This was a premodern globalization that ended with the end of the Bronze Age. However, the phenomenon of ritualized hoarding did not end and would continue until Christian states took hold in Europe north of the Roman Empire. Ritual hoarding/storing embodied a deep tradition of the use of inalienable objects and their deposition as a means of creating and maintaining power in decentralized, non-state societies, where power was always negotiable and not permanent, even if hierarchical.

▾ **KEYWORDS** Bronze Age value systems, pre-modern globalization, sacrificial economies, inalienable objects

Introduction

Reading the papers from this volume inspired me to re-theorize the concept of deposition in the Bronze Age, whether in hoards or burials. Therefore, the first point I wish to make is: we should consider all types of deposition in order to gain a full understanding of what is going on. The Bronze Age of Europe has been termed a ritual or sacrificial economy (Holst and others 2013; Kristiansen 2012; Fontijn 2020). Such economies are contrasted with so-called 'archival' economies, where rituals are centralized in temples and towns, and valuables are mainly recirculated (Fontijn 2020, fig. 8.4; Wengrow 2010). In the sacrificial economies, rituals are performed locally by every community. The two economies may be seen as representing different stages of development, the European Bronze Age still being anchored in chiefdom-like societies, while 'archival' economies of the eastern Mediterranean and the Near East mostly represent state-like societies. The two economies also interacted, and therefore new institutions and new concepts of value were introduced into Europe after 2000 BC (Fontijn 2020, fig. 8.5; Kristiansen and Larsson 2005).

This, therefore, is my second point of introduction: the Bronze Age represents the beginning of a premodern era (Kristiansen 2022; Vandkilde 2016), even if it was still couched in the mythological role of prestigious travels (Kristiansen and Larsson 2005, chapter 2), and an ideology of ritual destruction (Fontijn 2020). We are thus dealing with two different value regimes, and it is therefore considered meaningful to apply both the concept of personal prestige goods as a means

Kristian Kristiansen • University of Gothenburg, Department of Historical Studies, University of Copenhagen, Globe Institute (kristian.kristiansen@archaeology.gu.se)

Hoards from the European Bronze and Iron Ages: Current Research and New Perspectives, ed. by Marcin Maciejewski, János Gábor Tarbay, and Kamil Nowak, NAA, 4 (Turnhout, 2024), pp. 171–175.
BREPOLS PUBLISHERS DOI 10.1484/M.NAA-EB.5.142443

of forging political alliances (social value) and the concept of commodities as a means to characterize trade (economic value) (Harding 2021a, chapter 3; Kuijpers and Popa 2021). Thus, new concepts of value were introduced with the Bronze Age, which informed the characterization and interpretation of depositions. This was most eloquently exposed in David Fontijn's recent book *Economies of Destruction* (Fontijn 2020).

The Power of Ritual Destruction and Retrieval

In order to characterize practices of deposition, we should therefore start with a discussion of how power was achieved and maintained, including the role of ritual deposition. Why is it that certain objects are taken out of circulation and deposited, whether in burials or hoards? Here we need to understand the power of the gift. In her classic work *Inalienable Possessions*, Annette Weiner (1992) focuses attention on the apparent paradox that the power of exchange and gift-giving is bound up with the ability to keep. According to her, there are two types of transaction that are fundamental to social and cultural reproduction: those that have to do with maintaining the status quo, or stasis, and those that have to do with developing the status quo by giving gifts. And they are intrinsically interlinked. The ability of individuals, families, and social groups to create and keep objects of extraordinary qualities also imbues the gifts they give away with extraordinary qualifications. In this way, keeping while giving creates social differentiation and, once successfully established, maintains hierarchies. The power of things is employed to create power over people.

As rightly pointed out by David Fontijn, the massive deposition of valuables in later European prehistory, especially during the Bronze Age, is without an ethnographic counterpart and therefore demands historically specific theorizing (Fontijn 2020). While anthropology may provide us with a contextualized understanding of the social mechanisms, as indeed demonstrated in Annette Weiner's work, archaeology holds a unique position when it comes to tracing the rules of such vertical transactions and their historical impact in a longer-term perspective. This claim rests upon the proposition that burial wealth and ritual depositions represent a historically specific form of alienable possessions, a sophisticated ritualized way of 'keeping' that secures certain personalized or sacred objects' eternal memory and prevents them from entering into gift-giving and exchange. Buried under and protected by a barrow, it testified to the outstanding deeds not only of the person buried but also of the objects accompanying that person, male or female. Bards and priests through songs and hymns would maintain such memories. If we accept that grave goods represent a specific and powerful form of alienable possession, one can begin to understand grave robbery from the very same perspective as an act of stealing power by getting access to the desired objects. Naturally other motives were also at play simultaneously, such as humiliating a defeated chief and his lineage by robbing the graves of their ancestors. But that would, at the same time, alienate them from their power.

Hoard depositions can be considered from the same vantage point, except they exhibit greater variability and include the whole spectrum from commodities to prestige goods. However, hoard deposition differs from grave goods in one important aspect: hoards can be more easily retrieved. Perhaps they were mostly meant to be retrieved. As noted by David Fontijn (2020, 163): 'are ("profane") temporary storage and permanent ("ritual") deposition of metalwork really entirely different practices?' And his answer is that they are not: there is really no difference in the composition or other arrangements between hoards deposited on dry land or in wetlands (Kristiansen 1996). We should rather perceive hoarding as a practice of ritual/economic storage of objects that could be and were mostly retrieved when needed. According to this, the hoards that remained stored in the ground represent a minority group, which means that the practice of hoarding was much more widespread than normally perceived. Temporary 'ritualization' need not be in conflict with a possible later re-entry of the same material into society (Fontijn 2020, 163–64). It corresponds to the practice of keeping while giving, just described. It further implies that ritual practices linked to hoarding were commonly known and passed on from generation to generation in the same way as burial rituals (also Treadway, Chapter 3 in this volume). This is the case at least during those periods when hoarding prevailed in a region. Sometimes, for a variety of reasons we can only speculate about, depositions were not retrieved, and some were perhaps not meant to be retrieved if they represented a parallel deposition to an urn burial without grave goods, the old proposition that some personal hoards were to be considered as 'Totenschätze' (Hundt 1955; also Blajer, Chapter 2 in this volume). Other depositions were perhaps left in the ground due to unexpected circumstances, such as raiding, or similar unpredictable events, e.g., the burning down of a settlement. Since Bronze Age societies had become more complex with the introduction of metal (copper and tin) that had to be mined, smelted, and distributed for further use, there were multiple occasions where a deposition, whether ritual or practical, was considered relevant and perhaps necessary. We should thus expect the composition of metal hoards to reflect this diversity, to which I shall now turn (see also Blitte 2019 for comparative quantitative analyses between European regions).

A Model for Depositional Variability

To begin with, we need to start above ground in the practice of everyday life (Harding 2021b). With the new metal economy, there emerged new needs to store and protect such valuables, whether utilitarian (axes, sickles, or ingots and scrap metal), more costly ritual gear, such as lurs, bronze shields, and helmets, or personal prestige items such as weapons and ornaments, when not in use during the night[1] or between ritual events. If chiefly compounds acted as local centres of wealth redistribution, this is also where we should expect valuables of different types to be stored, under or above ground in the household. We sometimes find underground storage of amber inside farmhouses (Earle 2018), or depositions of scrap metal or axes in the vicinity of richly furnished burials and settlements, such as Smørumovre — a large collection of old and new axes and lances for a future distribution that never happened (Johansen 2015). One might also consider the possibility that chiefly compounds would be places to store/deposit weapons from the chiefly retinue of warriors when not in use, or sickles for the harvest during wintertime, which would explain many hoards. Such depositions could, of course, become permanent in the case of the chief dying or the house/farm being abandoned, like the famous Unetice longhouses at Dermsdorf and Zwenkau (Meller 2019; Randsborg 1995). But we should also consider the possibility that the deposition/storing of weapons was a regular ritualized event to commemorate a victory (Kristiansen 1999 and 2002; Melheim and Horn 2014), or that the end of harvest was celebrated with a harvest festival where sickles would be deposited for the winter. Finally, there is ample historical evidence that families and communities would store their valuables during times of war (Randsborg 2002).

We should therefore expect hoards to reflect this diversity of situations that I have described, ritual and non-ritual, but often linked to ritualized practices of different social groups/contexts in the landscape (Kristiansen 1996, Abb. 4; Hansen and others 2012; Maciejewski 2016 and Chapter 12 in this volume; also Chvojka, Chapter 9; Tarbay, Chapter 13). According to this model, the surviving non-retrieved hoards we are studying represent the tip of the iceberg of Bronze Age practices of storing and deposition. They are complementary to personalized burial depositions, and they broaden the scope of metal use, its social, economic, and ritual practices. Therefore, we should

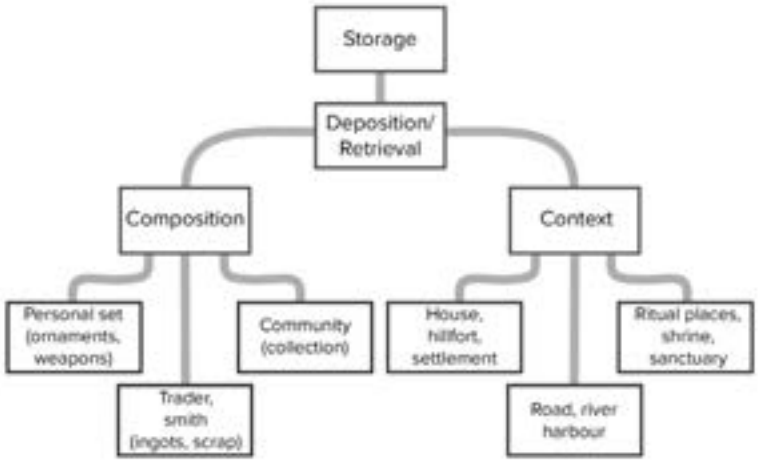


Figure 11.1. Model for depositional variability. The papers of this book reflect most of the variation in Fig. 11.1. Drawing Rich Potter.

expect changes in hoard depositions over the *longue durée* of the Bronze Age that reflect changes in the economic use of this raw material. One such change is linked to the role of weight standards. During the Early Bronze Age, ingots were used as a weight standard (Kuipers and Popa 2021), since scales and weights were not yet in use, in contrast to the Near East (Ialongo and others 2021). However, as weights and scales were introduced during the mid- to later second millennium BC it became possible to break up metal into smaller pieces that could be weighed. That is when scrap hoards enter the scene (Ialongo and Lago 2021; also Gauthier, Chapter 10 in this volume: Fig. 10.14), which differed from the ritual practice of intentionally damaging objects before deposition (Brandherm 2019).

Conclusion

Bronze Age societies were historically unique by carrying on old ritual traditions of storing and depositing valuables when a new metal economy took hold that transformed regional Neolithic and Chalcolithic societies into hierarchical, commercial societies. This was a premodern globalization that ended when the Bronze Age ended (Vandkilde 2016). However, the phenomenon of ritualized hoarding did not end and would continue until Christian states took hold in Europe north of the Roman Empire. Ritual hoarding/storing embodied a deep tradition of the use of inalienable objects and their deposition as a means of creating and maintaining power in decentralized, non-state societies, where power was always negotiable and not permanent, even if hierarchical.

1 Based on use-wear studies, it has been demonstrated that ornaments and weapons were in regular, daily use (Kristiansen 2013).

Works Cited

Blitte, Hélène. 2019. 'The Diversity of Bronze Age Hoards in Europe: Some Thoughts about a Social Practice and its Variations', in *Chasing Bronze Age Rainbows: Studies on Hoards and Related Phenomena in Prehistoric Europe in Honour of Wojciech Blajer*, ed. by Marcin S. Przybyła and Karol Dzięgielewski, Prace Archeologiczne No. 69 Studies (Kraków: Profil-Archeo Publishing House), pp. 27-40

Brandherm, Dirk. 2019. 'Überlegungen zur intentionellen Beschädigung und Fragmentierung von Hortbronzen', in *Chasing Bronze Age Rainbows. Studies on Hoards and Related Phenomena in Prehistoric Europe in Honour of Wojciech Blajer*, ed. by Marcin S. Przybyła and Karol Dzięgielewski, Prace archeologiczne, 69 (Kraków: Profil-Archeo Publishing House), pp. 41-58

Earle, Timothy. 2018. 'Amber Finds from the Bronze Age of Thy', in *Bronze Age Settlement and Land-Use in Thy, Northwest Denmark*, II, ed. by Jens-Henrik Bech, Berit V. Eriksen, and Kristian Kristiansen (Aarhus: Aarhus University Press), pp. 375-86

Fontijn, David. 2020. *Economies of Destruction: How the Systematic Destruction of Valuables Created Value in Bronze Age Europe, c. 2300–500 BC* (London: Routledge)

Hansen, Svend, Daniel Neumann, and Tilmann Vachta (eds). 2012. *Hort und Raum: Aktuelle Forschungen zur bronzezeitlichen Deponierungen in Mitteleuropa*, Topoi — Berlin Studies of the Ancient World, 10 (Berlin: De Gruyter)

Harding, Anthony. 2021a. 'The Movement of Commodities in Bronze Age Europe', in *Weight and Value*, II: *Merchants, Measures and Money*, ed. by Lorenz Rahmstorf, Gojko Barjamovic, and Nicola Ialongo (Kiel: Wachholtz), pp. 127-39

———. 2021b. *Bronze Age Lives* (Berlin: De Gruyter)

Holst, Mads Kähler, Marianne Rasmussen, Kristian Kristiansen, and Jens-Henrik Bech. 2013. 'Bronze Age "Herostrats": Ritual, Political, and Domestic Economies in Early Bronze Age Denmark', *Proceedings of the Prehistoric Society*, 79: 265-96

Hundt, Hans-Jürgen. 1955. 'Versuch zur Deutung der Depotfunde der nordischen jüngeren Bronzezeit unter besonderer Berücksichtigung Mecklenburgs', *Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz*, 2: 95–140

Ialongo, Nicola, and Giancarlo Lago. 2021. 'A Small Change Revolution. Weight Systems and the Emergence of the First Pan-European Money', *Journal of Archaeological Science*, 129: 105379

Ialongo, Nicola, Raphael Hermann, and Lorenz Rahmsdorf. 2021. 'Bronze Age Weight Systems as a Measure of Market Integration in Western Eurasia', *Proceedings of the National Academy of Sciences*, 118.27: e2105873118

Johannsen, Jens Winther. 2015. 'Serial Production and Metal Exchange in Early Bronze Age Scandinavia: Smørumovre Revisited', in *Forging Identities: The Mobility of Culture in Bronze Age Europe*, II, ed. by Paulina Suchowska-Ducke, Samantha Scott Reiter, and Helle Vandkilde, British Archaeological Reports, International Series, 2772 (Oxford: British Archaeological Reports), pp. 73-83

Kristiansen, Kristian. 1996. 'Die Hortfunde der jüngeren Bronzezeit Dänemarks. Fundumstände, Funktion und historische Entwicklung', in *Archäologische Forschungen zum Kultgeschehen in der jüngeren Bronzezeit und ältere Eisenzeit Alteuropas* (Bonn: Habelt), pp. 255-70

———. 1999. 'Understanding Bronze Age Weapon Hoards. Observations from the Zalkod and Vaja Hoards, Northeastern Hungary', *JAMÉ Jósa András Múzeum Évkönyve*, 41: 101-06

———. 2002. 'The Tale of the Sword – Swords and Swordfighters in Bronze Age Europe', *Oxford Journal of Archaeology*, 21.4: 319-32

———. 2012. 'Bronze Age Dialectics: Ritual Economies and the Consolidation of Social Divisions', in *Beyond Elites: Alternatives to Hierarchical Systems in Modelling Social Formations*, ed. by Tobias L. Kienlin and Andreas Zimmermann (Bonn: Habelt), pp. 381–92

———. 2013. 'Female Clothing and Jewellery in the Nordic Bronze Age', in *Counterpoint: Essays in Archaeology and Heritage Studies in Honour of Professor Kristian Kristiansen*, ed. by Sophie Bergerbrant and Serena Sabatini (Oxford: Archaeopress), pp. 755-69

———. 2022. 'Bronze Age Travelers', in *Rethinking Migrations in Late Prehistoric Eurasia*, ed. by Manuel Fernández-Götz, Courtney Nimura, Philipp W. Stockhammer, and Rachel Cartwright, Proceedings of the British Academy, 254 (Oxford University Press), pp. 89-109

Kristiansen, Kristian, and Thomas B. Larsson. 2005. *The Rise of Bronze Age Society: Travels, Transmissions and Transformations* (Cambridge: Cambridge University Press)

Kuijpers, Maikel H. G., and Cătălin N. Popa. 2021. 'The Origins of Money: Calculation of Similarity Indexes Demonstrates the Earliest Development of Commodity Money in Prehistoric Central Europe', *PLoS ONE*, 16.1: e0240462

Maciejewski, Marcin. 2016. 'Metal – Border – Ritual. Hoards in Late Bronze Age and Early Iron Age Landscape', in *Landscape in the Past & Forgotten Landscapes*, ed. by Piotr Kołodziejczyk and Beata Kwiatkowska-Kopka, Cracow Landscape

Monographies, 2 (Kraków: Institute of Archaeology Jagiellonian University and Institute of Landscape Architecture Cracow University of Technology), pp. 263-75

Melheim, Lene, and Christian Horn. 2014. 'Tales of Hoards and Swordfighters in Early Bronze Age Scandinavia: The Brand New and the Broken', *Norwegian Archaeological Review*, 47.1: 18-41

Meller, Harald. 2019. 'Princes, Armies, Sanctuaries. The Emergence of Central Authority in the Central German Únětice Culture', *Acta archaeologica*, 90.1: 39-79

Randsborg, Klavs. 1995. *Hjortspring: Warfare and Sacrifice in Early Europe* (Aarhus: Aarhus University Press)

——. 2002. 'Wetland Hoards', *Oxford Journal of Archaeology*, 21.4: 415-18

Vandkilde, Helle. 2016. 'Bronzization: The Bronze Age as Pre-modern Globalization', *Prähistorische Zeitschrift*, 91.1: 103–23

Weiner, Annette B. 1992. *Inalienable Possessions: The Paradox of Keeping-While-Giving* (Berkeley: University of California Press)

Wengrow, David. 2010. *What Makes Civilization: The Ancient Near East the Future of the West* (Oxford: Oxford University Press)

NEW APPROACHES IN ARCHAEOLOGY

All volumes in this series are evaluated by an Editorial Board, strictly on academic grounds, based on reports prepared by referees who have been commissioned by virtue of their specialism in the appropriate field. The Board ensures that the screening is done independently and without conflicts of interest. The definitive texts supplied by authors are also subject to review by the Board before being approved for publication. Further, the volumes are copyedited to conform to the publisher's stylebook and to the best international academic standards in the field.

Titles in Series

Animals and Animated Objects in the Early Middle Ages, ed. by Leszek Gardeła and Kamil Kajkowski (2023)

Consumption, Ritual, Art, and Society: Interpretive Approaches and Recent Discoveries of Food and Drink in Etruria, ed. by Lisa Pieraccini and Laurel Taylor (2023)

The Common Thread: Collected Essays in Honour of Eva Andersson Strand, ed. by Ulla Mannering, Marie-Louise Nosch, and Anne Drewsen (2024)

In Preparation

Alabaster: An Interdisciplinary Study of the Sources and Uses of Calcite-Alabaster across Archaeological Contexts, ed. by Simon J. Barker and Simona Perna